

**FEMP**

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U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy

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... and more!

## CHP and PV Increase Power Reliability at Twentynine Palms MAGTFTC

The Marine Air Ground Task Force Training Command (MAGTFTC) at Twentynine Palms, California, unveiled a new 7.2-megawatt dual-fueled combined heat and power (CHP or cogeneration) system in February 2003. This project is an outstanding demonstration of the value of CHP for addressing both energy cost and energy security issues at federal sites. The \$16 million CHP project, including more than 3 miles of high-pressure gas lines, design, construction, and financing will pay for itself in less than 4 years. In fact, the revenue stream from this project is providing the financing for phase-three upgrades under an energy savings

performance contract (ESPC), including a 1.2-megawatt photovoltaic (PV) system, three chiller plants, and several other critical infrastructure improvements.

In the Mojave Desert 45 miles north of Palm Springs, the MAGTFTC has a twofold mission—to operate the U.S. Marine Corps Air Ground Combat Center for live-fire combined arms training that promotes readiness of operating forces, and to provide facilities, services, and support responsive to the needs of tenant commands, Marines, sailors, and their families. Energy security is critical to ensuring readiness of operating forces.

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*The new 7.2-megawatt dual-fueled combined heat and power system at the Marine Air Ground Task Force Training Command, Twentynine Palms, CA.*



**FEMP Focus Interview – see page 3.**

Dr. Get W. Moy, P.E., Director of Utilities & Energy,  
Office of the Deputy Under Secretary of Defense (Installations and Environment)

# The Director's Column



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Typical headlines that we have been seeing in the news lately are:

- “Hurricane Isabel Batters the East Coast; Federal Government Shut Down”
- “Massive Blackout Shuts Down New York City”
- “Natural Gas Prices Expected to Remain High”
- “Bills to Rise as Mercury Drops”
- “Electrical Grid Vulnerable to Hackers, Viruses”

Federal agencies throughout the nation are subject to electrical system blackouts, price hikes, and energy system vulnerabilities. We have been assessing the situation and are developing and implementing smart energy management solutions that will increase our energy security and reduce our exposure.

In this issue of the *FEMP Focus*, you can read about Federal agencies’ smart energy management solutions:

- Dr. Get Moy, Director, Utilities and Energy Office of the Deputy Under Secretary of Defense (Installations and Environment), discusses how the Department of Defense tackles such issues as the security of the utility infrastructure, the role of distributed generation and renewable energy, and strategies for dealing with fluctuations in energy prices (see page 3).
- The U.S. Marine Corps base at Twentynine Palms, CA, implemented distributed generation using renewables and combined heat and power systems to increase energy security, reduce costs, and save energy (see cover article).
- The Environmental Protection Agency and the Department of Energy have launched the Laboratories for the 21<sup>st</sup> Century program to improve the energy and environmental performance of our nation’s laboratories.
- We in the federal government continue to lead by example in energy management and we celebrate our success with ENERGY STAR® labels, Showcase designations, and DOE awards (see page 29).

For all of you who attended Energy 2003 in Orlando, Florida—thank you. We had an outstanding workshop and exposition. The speakers gave excellent, substantive presentations in well-attended sessions. The exhibits were varied, informative, and extensive. We were all energized!

Finally, I am looking forward to our annual Federal Energy and Water Management Awards Ceremony in October. Each year, I am impressed by the excellent work that you are doing, not just here in the United States, but around the world as well. You are truly leading by example.

— Beth Shearer, Director  
Federal Energy Management Program

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energy and taxpayer dollars  
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## DOD's Dr. Get Moy on Energy Security

FEMP recently spoke with Dr. Get W. Moy, P.E., Director of Utilities & Energy, Office of the Deputy Under Secretary of Defense (Installations and Environment), who offers insight on DOD's energy program and how they approach such issues as security of utility infrastructure, the role of distributed generation and renewable energy, and fluctuations of energy prices. Dr. Moy is responsible for the development, implementation, and oversight of Defense policy in the areas of energy and water resource management, utility acquisition, and utilities privatization.

**FEMP Focus:** Please describe the mission of the Utilities and Energy Office, Deputy Under Secretary of Defense (Installations and Environment).

**Dr. Get Moy:** Our mission is to ensure that the DOD utility infrastructure is secure, safe, reliable, and efficient; that energy and water commodities are procured effectively and efficiently; and, that the components maximize energy and water conservation efforts. The Department has made great strides in energy efficiency and consumption reduction but must do more in order to meet the Departmental vision of providing reliable and cost effective utility services to the warfighter.

**FEMP Focus:** You mentioned the security of DOD's utility infrastructure, what is your office's strategy for ensuring this?

**Dr. Get Moy:** The Department has set a course to modernize our infrastructure in order to provide more reliable utilities and improve energy flexibility through expanded use of renewable energy.

**FEMP Focus:** Can you explain what utility privatization is and how it contributes to energy security?

**Dr. Get Moy:** Historically, military installations have been unable to maintain reliable utility systems due to inadequate funding, and competing installation management and operational priorities. Utilities privatization is the preferred method for modernizing and recapitalizing DOD utility systems. By allowing military installations to focus on core defense missions and functions instead of the responsibilities of utility ownership, this program will transform how installations maintain utility services. By becoming smart buyers of utility



*Dr. Get W. Moy, P.E., Director of Utilities & Energy, Office of the Deputy Under Secretary of Defense (Installations and Environment)*

services, activities will benefit from innovative industry practices, the reliability of systems kept at current industry standards, and private sector financing and efficiencies. Following the guidance issued on October 9, 2002, the Military Services shall complete privatization decisions on all electric, water, wastewater, and natural gas systems by September 30, 2005. Except where the Service Secretary has certified that the systems are exempt due to security reasons or privatization is uneconomical, Services will privatize those types of utility systems at every Active, Reserve, and National Guard installation, within the United States and overseas, that is not designated for closure under a base closure law. Since upgrades are normally completed within 5 years after a privatization award is made, all privatized systems should be

operated and maintained at an equivalent industry standard level by 2010. Maintaining the readiness level to this standard will enhance our energy security as it pertains to reliability.

**FEMP Focus:** What about the role of distributed generation and renewable energy in ensuring DOD's energy security?

**Dr. Get Moy:** DOD is committed to creating opportunities to install distributed generation, including the use of renewable energy technologies, when life-cycle cost-effective to enhance energy flexibility and security. Distributed energy resources will be used for on-site generation using micro-turbines, fuel cells, combined heat and power, and renewable technologies when determined to be life-cycle cost effective or to provide flexibility and security to mitigate unacceptable risk. Off-grid generation, owned and operated by Defense Components may make sense for mission criticality and remote sites when it is life-cycle cost-effective. In these cases, innovative energy generation technologies such as solar lighting, large photovoltaic arrays, wind turbine generators, micro-turbines, and fuel cell demonstration projects shall be utilized. Passive solar designs, such as building orientation and window placement and sizing, are also implemented in a variety of building types and new facility construction. The Department is currently formulating a comprehensive renewable energy development and purchasing plan which will be used as our road map toward achieving increased energy security. The plan will explore efficiency opportunities in life-cycle cost effective renewable energy

*continued on page 4*



**DOD'S DR. GET MOY ON ENERGY SECURITY***(continued from page 3)*

efficiency opportunities in life-cycle cost effective renewable energy technologies such as wind, biomass, geothermal, ground source heat pumps, and photovoltaics. Self-generated power is currently coupled with ground-source heat pumps, solar water heating systems, and photovoltaic arrays to generate electricity at isolated locations, such as range targets, airfield landing strip lighting, and remote water pumping stations.

**FEMP Focus:** *Many of our readers are facility managers of individual buildings or installations, can you offer them any insights about how they can achieve a level of energy security in their buildings?*

**Dr. Get Moy:** Ultimately, energy security is defined as providing reliable and cost effective utility services to the building occupant. As a team, they need to come to grips with how best that can be achieved, in the provisions of the primary power, back-up power, on-site generation, or flexible energy sources.

**FEMP Focus:** *The inevitable fluctuations of energy prices also pose a threat to energy security. What is DOD's strategy for dealing with these situations?*

**Dr. Get Moy:** EO 13123 requires that federal agencies take advantage of competitive opportunities in the electricity and natural gas markets to reduce costs and enhance services. Defense Components are partnering with the Defense Energy Support Center (DESC) to identify and develop risk mitigation strategies appropriate for their risk preference profile and are considering aggregation of demand across facilities or agencies to maximize our economic advantage. For example, it is DOD's policy to competitively acquire direct supply natural gas under the Direct Supply Natural Gas Program (DSNG) managed by DESC when cost effective and the anticipated reduced energy costs have the same degree of supply reliability as other practicable alternative energy sources.

**FEMP Focus:** *What did we learn from the California electricity crisis of 2001? Is DOD prepared for similar threats to reliability in the future?*

**Dr. Get Moy:** Interestingly enough, the Department was not affected by any major utility outages during the crisis, however we did encounter an economical impact due to the escalating cost of energy. As a result of the President's May 3, 2001 Directive, DOD Installations' emergency load reduction plans were updated. Defense Components continue to identify load shedding techniques to cut electricity consumption in buildings and facilities during power emergencies. Examples of the techniques being used include: EMCS; sub-metering; cogeneration; thermal storage systems; duty cycling of A/C in military family housing by EMCS; alternative energy sources for air-conditioning; and turning off unneeded lights with motion sensors and separate lighting circuits. In addition, the

Department continues to focus its energy conservation program on measures that reduce electric consumption. Also, the Department continues to pursue use of alternative energy sources as a means to improve flexibility and to help sustain critical operations.

**FEMP Focus:** *Could you cite some specific DOD installations or projects which exemplify DOD's approach to energy security?*

**Dr. Get Moy:** A model example of a comprehensive energy security program is the Marine Air Ground Task Force Training Command at Twentynine Palms, California. They awarded an Energy Savings Performance Contract (ESPC) valued at approximately \$51 million. ESPCs are a contract mechanism which allow federal agencies to fund improvements from energy savings and energy-related operational savings using standard performance guarantees. It is estimated that the ESPC will save the base about \$6.9 million each year during the course of the contract's 20-year term, for a total savings of \$138 million. The 7 megawatt cogeneration system includes construction and maintenance of three chilled water plants, a

photovoltaic plant, solar daylighting, and an energy management system. The plant's 1.1 megawatt photovoltaic cell array will require six to eight acres of land on the base, and will be used to supplement electric capacity during peak load periods.

The contract also includes the installation of lighting controls and daylighting in a dozen warehouses on the base to help reduce peak energy demand. Overall annual energy reduction resulting from this ESPC will be more than 180 billion Btu per year, reducing the Base's current electricity consumption by 76 percent. The cogeneration plant provides for the capture of waste heat from power production, thus increasing fuel utilization efficiency. Waste heat-steam from the cogeneration plant will provide thermal energy for absorption chillers to support operation of a new chilled water distribution system. The cogeneration plant and photovoltaic systems provide the Base with a sizeable stand-alone source of reliable, efficient, and secure electricity and hot water. The cogeneration plant will supply four main feeder lines to the central portion of the Base, providing an uninterrupted power supply of the critical base loads in the event of utility interruptions, and will provide 68 percent (56,402 megawatt-hours per year) of the Base's electricity requirement.

**FEMP Focus:** *As a FEMP constituent, how do you think FEMP can facilitate energy security throughout the government?*

**Dr. Get Moy:** DOD is pursuing off-grid generation to provide security and flexibility where it is life-cycle cost effective. FEMP's Distributed Energy Resources (DER) and Combined Heat and Power (CHP) Programs provide DER workshops/training

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and free CHP screening to the Military Services. Additionally, partnerships with the private sector through Utility Energy Service Contracts (UESC) and ESPCs are a crucial tool for financing energy efficiency measures that allow installations to improve and modernize their infrastructure and pay for energy efficiency measures through the savings generated by the project over time. DOD Installations and Major Commands can use FEMP's Super ESPCs and UESCs to provide alternative financing contracting vehicles in addition to Naval Facilities Engineering Command, Huntsville Engineering and Support Center, and DESC (a few Commands and Installations use their own internally developed ESPC contracts). The DOE FEMP/DOD ESPC Steering Group is also an active proponent in developing policy that not only affects DOD but transcends across all agencies. In the near term, FEMP could take the lead in developing a universal definition of energy security that can be consistently used throughout the federal sector. The Department looks to FEMP for developing and employing tools and authorities for agencies to use, establishing and maintaining communications avenues across the Federal sector, and being the

Federal advocate for energy programs. Remember, FEMP's mission is energy. Our mission is defense of the country.

**FEMP Focus:** *Thank you for speaking with us. Do you have any final thoughts to share with our readers?*

**Dr. Get Moy:**

- Reliability
- Efficiency
- Conservation
- Flexibility
- Security

These are hallmarks of the DOD energy program. The innovative nature of our people, the mission we support, and the partnerships that we have with our fellow agencies, all contribute to define the urgency of our programs and their successful accomplishments.

*For more information, please see the Office of the Deputy Under Secretary of Defense (Installations and Environment) web site at [www.acq.osd.mil/ie/](http://www.acq.osd.mil/ie/).*

## Sandia Supports Renewable Energy at Quantico Marine Base

When the U.S. Marine Corps at Quantico, VA, wanted to include renewable resources in their base energy security mix, they relied upon DOE's Sandia National Laboratories to bring a solar hot water project to successful completion earlier this year. Sandia managed the contract from procurement through final inspection, serving as liaison between Quantico and the system contractor, BTF.

The solar hot water system offsets energy needed to heat an Olympic-sized swimming pool at Ramer Hall. The collector aperture area (the portion of the collector that absorbs the solar energy) is 280 square feet, large enough to realize an annual cost savings of about \$3,000. Base energy managers, eager to strengthen their already comprehensive energy security plan, realized that using renewable energy (in this instance solar energy) served that purpose.

The Ramer Hall system is a simple antifreeze closed loop system, whereby antifreeze is circulated from outside the heat exchanger through solar collectors in a continuous cycle. The collectors are Heliodyne Gobi 410, which should require no maintenance other than an occasional visual inspection. The heat exchanger, made by Young Touchstone, is a shell-and-tube-type designed for counter flow. A Grundfos pump provides the proper flow rate for the collectors, and a Compool Solar Control System that uses a differential thermostat completes the components.

Backup for the system is steam, which is supplied by a nearby plant and is fed to the pool system mechanical room via pipes. A three-valve bypass was installed in front of the existing steam heat exchanger. When the bypass valve is closed and the valves to and from the solar heater exchanger are open, pool water flows through the solar heat exchanger before going to the steam heat exchanger. If the solar pump is running and circulating warm antifreeze through the shell side of the heat exchanger, the steam heat exchanger's automatic control will not sense the need to add heat from the conventional, backup heat source. Sandia recommended installation of a Btu meter to verify that the system is working and to determine how much energy is supplied by the solar portion of the system.

Under the BTF contract, maintenance and operations manuals and training were provided for Ramer Hall facilities and maintenance staff.

Ready to capitalize on the success of this solar hot water project, Quantico energy officials have identified other projects where renewable energy is both practical and economical, such as other hot water systems and parking lot lights.

*For technical specifications and further information contact the following individuals at Sandia National Laboratories: Marlene Brown at [mbrown@sandia.gov](mailto:mbrown@sandia.gov) or Dave Menicucci at [dfmenic@sandia.gov](mailto:dfmenic@sandia.gov).*

# Wood Waste to Energy—An Old Technology with New Benefits for Federal Facilities

Wood, the oldest and most common source of fuel for energy production, is receiving renewed interest because of its advantages in reducing costs and environmental impacts as well as its benefits with respect to energy security. This interest is reflected in recent data on energy usage. Biomass recently surpassed hydroelectric as the leading source of renewable energy in the country accounting for more than 50 percent of the nation's renewable energy use (that translates to more than 7,700 megawatts of electricity at thousands of large and small biomass-to-energy plants). The leading contributors to this impressive total are wood waste-to-energy plants. Now, federal facilities can implement their own biomass projects using FEMP's streamlined contract vehicle, the Biomass and Alternative Methane Fuels (BAMF) Super Energy Savings Performance Contract (ESPC).

The benefits of wood-to-energy projects are numerous. Compared to fossil fuels, utilizing wood waste as a fuel produces less nitrogen oxides, less ash, virtually no sulfur emissions, and no net increase in carbon dioxide (because trees remove carbon dioxide from the atmosphere). It also reduces the volume of waste to landfills.

There are huge quantities of wood waste generated each year in the United States and the vast majority of it is unutilized or significantly underutilized. Because of its abundant supply, wood waste offers substantial benefits in energy security. A domestic alternate fuel source affords protection against interruptions in the supply of other fuels and the large number of wood waste sources also provides protection against fuel price volatility.



## Applications

Given the age of the industry, it is not surprising that converting wood to energy is a mature and well-established technology. Whether the application is for space heat, process heat, or the production of electricity, no other type of fuel has been used successfully in more types of projects or system designs. There are, in addition, many attractive new developments that could have a large impact on the energy industry. Included among these are small modular gasification systems and the larger biomass gasification combined cycle systems that provide dramatic increases in efficiency.

More typically, the wood is used to produce steam in a boiler using standard stoker technology or newer fluidized bed combustion technology. Energy is currently produced this way in thousands of settings throughout the world using conventional, "off the shelf" equipment. The systems can be designed to produce heat, electricity, or both in combined heat and power systems. Wood biomass systems produce electricity in units ranging in size from 5 kilowatts to 75 megawatts.

*This is the third in a series of articles highlighting renewable biomass and biogas resources that federal facilities can utilize under FEMP's new Biomass Super ESPC, which offers financing and private-sector expertise specifically geared to BAMF resources.*

Another viable application for wood waste as a fuel is in the co-firing of conventional coal-fired boilers. Here, co-firing refers to the introduction of biomass as a supplementary energy source in high efficiency boilers. In most instances, this practice requires relatively minor modifications to existing systems and can significantly decrease emissions of sulfur dioxide and nitrogen oxide.

## Economics of Wood-to-Energy

The heat content of wood waste typically ranges from 8 to 18 million Btu per ton depending primarily on the moisture content. For grid-connected, utility-size energy plants the energy cost per Btu of wood is similar to that of coal. However, for smaller projects (1 to 5 megawatts) it is possible in many locations to secure a supply of wood waste for only the cost of transportation, presenting the supplier with a better option than landfilling. The economics of biomass projects are highly dependent on transportation costs with 50 miles being the furthest that the fuel is typically transported. To avoid price hikes associated with a limited supply, it is better to design biomass systems that do not outsize the local supply and also have several different sources of supply available.

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## Potential Sources of Wood Waste

Waste wood is generated in tens of thousands of businesses and industries throughout the country. Although many of the sources generate quantities too small to be collected economically, there are estimated to be more than 5,000 facilities that generate significant quantities of wood waste. Today, in the United States, wood waste used in energy systems comes mainly from manufacturing residues, construction/demolition debris, and dedicated energy crops. Manufacturers of wood products generate an enormous amount of residue in the process of making lumber, furniture, pallets, paper, etc. In general, less than 50 percent of the tree ends up in a final product with the balance being waste in some form. Although some of this waste (e.g., the black liquor remainings from making paper) is used exclusively for internal plant energy requirements, in most cases it is either not used or under utilized. This represents a vast untapped resource. Approximately 144 million tons of wood residuals result from the milling process (including logging) each year; 37 million tons come from construction/demolition; and 32 million tons originate from waste wood/yard trimmings. The portion of wood waste that is sent to landfills could otherwise serve as a cost-effective fuel for a biomass energy project.

A resource assessment developed for FEMP by DOE's National Energy Technology Laboratory has identified more than 1,200 large (over 100,000 square feet) federal facilities that are within 50 miles of at least 10 sources of wood waste that could serve as a fuel supply for a biomass project. There are more than 4,700 wood waste sources within 50 miles of these facilities. (The national map below displays the wood waste sources that are within 50 miles of a large Federal facility.) Either federal agencies as consumers, or suppliers of wood waste as sellers, can locate potential matches by contacting the staff at the BAMF Program.

## Benefits of a Biomass Project Through BAMF Super ESPC

Under the BAMF Super ESPC, agencies can partner with prequalified, competitively selected energy services companies (ESCOs) and use an expedited contracting process to implement their projects quickly, avoiding the uncertainty and delay of depending on appropriated funding. The ESCO arranges financing for project development, equipment, and installation, and the debt is paid back over time from the guaranteed cost savings generated by the project. FEMP's experienced project facilitators can guide the agency through the entire process, providing expert consultation and assistance with technical, contractual, and financial aspects of the project. Benefits that can be expected with implementation of a biomass project through the BAMF contract are:

- Energy cost savings;
- Energy security—Protection against interruptions in the gas and electric grids by having an alternate fuel source;
- Utility cost stabilization—Protection against price volatility;
- Environmental benefits—Wood waste as a fuel compared to fossil fuels produces less nitrogen oxides, less ash and virtually no sulfur emissions. It reduces the volume to landfills. Also in terms of greenhouse gases, there is no net increase in carbon dioxide, because trees remove carbon dioxide from the atmosphere (as opposed to fossil fuels); and
- Meets Federal goals for use of renewable energy and an alternative financing vehicle.

*To find out more about the process for using the BAMF Super ESPC to implement a biomass energy project at your facility, contact one of the following: Christopher Abbuehl, BAMF National Program Representative, at 215-656-6995 (Christopher.Abbuehl@ee.doe.gov); Steve Cooke, BAMF Technical Lead, at 304-285-5437 (steve.cooke@netl.doe.gov); or Danette Delmastro, FEMP BAMF Team Lead, at 202-586-7632 (danette.delmastro@ee.doe.gov).*



*Is there a wood waste supply close to you?*



## Distributed Generation and Combined Heat and Power Workshops a Success—Resources Available

The Distributed Generation and Combined Heat and Power Workshop, sponsored by FEMP, was held in conjunction with the Third Annual DOE/ United Nations Hybrid Power Systems Conference, May 13-15, 2003, in Newport Beach, California. Co-sponsored by DOE's Denver and Seattle Regional Offices, this meeting concluded a four-part regional series.

Similar workshops were held over the past year in Atlanta, Chicago, and Boston. Each brought together federal and state government facility and energy managers, distributed generation (DG) and combined heat and power (CHP) equipment manufacturers, system developers, and consulting engineers, regional, state, and local energy and environmental code and permitting officials, financing professionals, trade organizations, and non-profit associations to discuss project implementation, energy security, and reducing energy costs. Topics included:

- DG and CHP technologies and systems,
- DG and energy security,
- Resources for developing DG and CHP projects,
- Financing DG and CHP projects,
- Case studies of successful DG and CHP projects, and
- Getting started with a DG or CHP project.

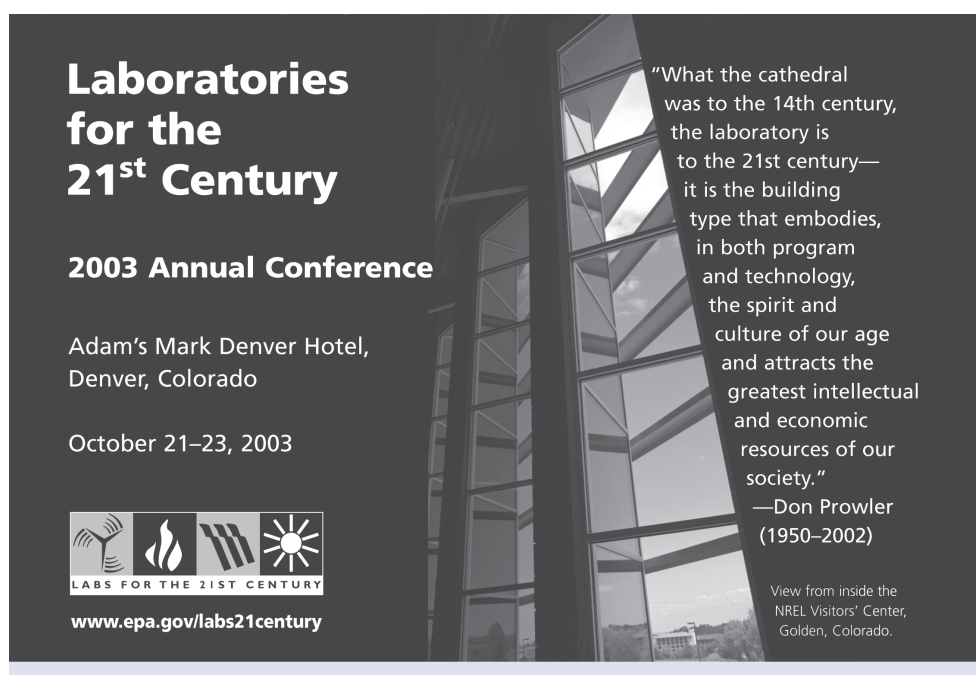
The combined total of 500 participants, one-fifth from the federal sector, learned about the costs, benefits and installation issues related to DG and CHP technologies in federal facilities.

Two of the sessions had the added value of being held in conjunction with other industry related meetings. The Boston region's workshop was held jointly with the United States Combined Heat and Power Association's CHP annual roadmap workshop. The Newport Beach workshop gathering also facilitated new connections with the hybrids program as attendees from both conferences participated in joint welcoming and plenary discussions and met during technical sessions.

Participants noted that the combination of educational sessions, networking opportunities, site visits, and social time made for a very valuable experience.

The final agenda with PDF versions of the presentations for all four workshops are available on the FEMP web site at [www.eere.energy.gov/femp/techassist/news.html#workshops](http://www.eere.energy.gov/femp/techassist/news.html#workshops).

*For information on the DER/CHP program, please contact Shawn Herrera, FEMP DER/CHP Program Manager at 202-586-1511 or [shawn.herrera@ee.doe.gov](mailto:shawn.herrera@ee.doe.gov). For additional information on the Distributed Generation and Combined Heat and Power Workshops, contact Marion Rawson at [mrawson@energeticsinc.com](mailto:mrawson@energeticsinc.com).*




**Laboratories  
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21<sup>st</sup> Century**

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was to the 14th century,  
the laboratory is  
to the 21st century—  
it is the building  
type that embodies,  
in both program  
and technology,  
the spirit and  
culture of our age  
and attracts the  
greatest intellectual  
and economic  
resources of our  
society."  
—Don Prowler  
(1950–2002)

View from inside the  
NREL Visitors' Center,  
Golden, Colorado.



# Laboratories for the 21st Century: Program Highlights

From Taiwan to Tewksbury, Massachusetts, a growing network of laboratory designers, engineers, and facility managers is defining the next generation of laboratories. While each may be designing, building, or managing a different type of laboratory, they share a common goal—to create a high-performance, low-energy built environment.

To support this encouraging trend, the Environmental Protection Agency (EPA) and the Department of Energy (DOE) joined forces to launch the Laboratories for the 21st Century (Labs21) program. The goal of Labs21 is to improve the energy and environmental performance of our nation's laboratories. Now reaching more than 1,500 practitioners around the globe, Labs21 continues to expand its tools and services, as well as the opportunities for involvement by the laboratory community.

Some of the latest developments of the program are highlighted below. We encourage you to learn more about Labs21 and share your expertise by getting involved with one of the numerous partnership opportunities.

## Pilot Partner Profiles

Labs21 is actively working with more than a dozen public and private sector Pilot Partners to create high performance, showcase laboratories. From university laboratories to sophisticated microelectronics testing facilities, each project demonstrates “new thinking” in terms of laboratory design, operation, and maintenance. In October, Labs21 will invite all of the nation's laboratories to join the program as Partners. To learn more, see the article on page 12

profiling current Partners, as well as the criteria for joining these industry leaders.

## New Tools and Resources

Labs21 is working to equip laboratory designers and engineers with the tools they need to achieve aggressive energy and environmental performance goals. The program's long-term goal is to offer a suite of tools to assist laboratory designers at each stage of the design process—from the earliest conceptual stages through benchmarking environmental performance.

The Design Intent Tool (see page 15), provides a framework for tracking design decisions throughout the course of a project. The Labs21 Benchmarking Tool (see page 14), is part of a broad-based initiative to enable laboratory owners to benchmark their energy performance against similar laboratories.

Labs21 has also published a series of case studies, exploring the unique characteristics of some of the country's “greenest” laboratories. To learn more, see the article on page 13 summarizing the lessons learned from these top performers.

## Education and Training

Each year, Labs21 sponsors an international conference, which has grown from a small working group to a gathering of more than 600 professionals interested in sustainable laboratory design. This year's conference, to be held in Denver, Colorado, on October 21-23, will feature more than 60 presentations on a variety of topics, from state-of-the-art design and management strategies to case studies of industry-leading projects.

Labs21 also offers a series of one-day courses across the country on high-performance, low-energy laboratory design. To date, the course has trained more than 1,000 laboratory designers, energy managers, and facilities professionals.

## Other Initiatives

In addition to these efforts, Labs21 continues to support a number of other new initiatives. As one example, the Labs21 Student Design Competition challenges architecture students and faculty to design a “green” laboratory. Working with the Association of Collegiate Schools of Architecture, Labs21 has invited more than 200 schools in the United States and Canada to participate and will provide national recognition to the winners.

Working in partnership with a number of prominent universities, another goal of Labs21 is to create a network of regional centers of excellence across the country. As currently envisioned, each of these centers—under development at Harvard University, Virginia Tech, and the University of Hawaii—would offer technical support and information to the increasingly diverse and complex network of laboratories nationwide.

To learn more about these and other exciting developments, visit the Labs21 web site at [www.epa.gov/labs21century](http://www.epa.gov/labs21century).

*For more information, please contact Will Lintner, FEMP Labs21 Program Manager, at 202-586-3120 or [william.lintner@ee.doe.gov](mailto:william.lintner@ee.doe.gov).*

## Partners in Sustainable Design

From retrofitting 1950s-era under-graduate laboratories into state-of-the-art energy-efficient chemical engineering facilities, to designing a new science and technology research facility using a “whole building” approach, Labs21 Partners are at the forefront of sustainable laboratory design.

Through the Labs21 Partnership Program, EPA and DOE are working with more than a dozen private and public sector organizations to develop sustainable, high-performance, and low-energy laboratories. By setting goals to reduce energy and water use in defined projects, each Partner is demonstrating the potential for improved laboratory design, construction, and management worldwide.

In joining the program, Partners voluntarily agree to apply sustainable design and management practices to a specific laboratory project. In exchange for this commitment, they enjoy a long list of benefits—from national recognition to the opportunity for technical assistance. Below are a just a few examples of how Labs21 Partners—from microelectronic and pharmaceutical companies to universities and federal agencies—are setting the standard for laboratories in the 21st century.

- Currently under construction, DOE’s Sandia National Laboratories’ 377,000 square-foot Microsystems and Engineering Sciences Applications Complex in Albuquerque, New Mexico, is expected to be 30 percent less energy-intensive than similar buildings at Sandia. In addition, this state-of-the-art complex will reclaim and recycle its process water.
- The University of California-Merced has set a number of challenging energy efficiency goals for its new Science and Engineering Building. To achieve these goals, the university is employing efficient lighting, low pressure-drop air systems, variable air volume fume hood systems, solar controls through shading and high-performance glazing, and other measures.
- By incorporating numerous energy saving features into its new Science and Technology Facility, DOE’s National Renewable Energy Laboratory expects to achieve a 41 percent energy cost savings over similar conventional buildings. The Golden, CO, facility will include 100 percent ambient daylighting in offices (50 percent in labs), use waterless urinals and high efficiency chillers, recapture



*Duke University's Levine Science Research Center in Durham, NC.*

stormwater runoff for use in irrigation, and allow for easy future additions of building-integrated photovoltaics as an electricity source. Through these efforts, they hope to achieve a U.S. Green Building Council LEED™ Gold rating for this facility.

- To improve energy efficiency at its 300,000 square-foot Levine Science Research Center, Duke University is measuring the impact of various exhaust hood management practices and strategies on energy utilization. The university is also applying “whole building” design to a number of laboratories on campus.

This fall, Labs21 will transition beyond the “pilot” phase of its Partnership Program. At that time, all public and private sector organizations in the United States interested in improving their laboratories’ energy- and water-efficiency, encouraging the use of renewable energy sources, and promoting environmental stewardship will be invited to join the program. New Partners can take advantage of the many valuable lessons learned during the pilot phase, including

- Setting energy and environmental performance goals at the outset of a project and reinforcing these goals throughout the course of the project.
- Using Labs21 tools, such as the Environmental Performance Criteria, to help establish and evaluate design alternatives.

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# Lessons Learned from the Labs21 Case Studies

Designers interested in building attractive, comfortable, energy-efficient laboratory buildings can now learn more about the most effective techniques, thanks to the Labs21 case studies. Labs21 has compiled numerous design options and energy-efficient systems in the program's published case studies of state-of-the-art labs.

These case studies show how—without compromising safety—actual laboratory buildings are saving 30 percent or more of the energy that similar, less efficient buildings would use. Many are conserving water as well. To date, six case studies have been published on various types of federal, state, and private-sector labs, and two more will be available later in 2003. These case studies are part of a suite of Labs21 tools developed to assist lab designers.

## PARTNERS IN SUSTAINABLE DESIGN

*(continued from page 10)*

- Securing a project champion, as well as buy-in from both upper-level management and laboratory users.
- Allowing for flexible design strategies, since all laboratories (and laboratory projects) are unique.

With the expansion of the Partnership Program, Labs21 hopes to achieve market transformation by offering assistance to a wider variety of public and private labs as they create sustainable laboratories of the future. To learn more about the Labs21 Partnership Program, visit [www.epa.gov/labs21century/partnership.htm](http://www.epa.gov/labs21century/partnership.htm).

*For more information, contact Will Lintner, FEMP Labs21 Program Manager, at 202-586-3120 or [william.lintner@ee.doe.gov](mailto:william.lintner@ee.doe.gov).*

What has been learned from these case studies? First, variable-air-volume (VAV) supply and exhaust systems are a highly effective way to save energy. Almost all the case study buildings have VAV systems. Since ventilation loads are the dominant energy user in labs, VAV systems offer the greatest savings of all the strategies studied. To get an idea of the extent of these savings, note that one fume hood uses as much energy in one year as three typical houses, and lab buildings can contain several hundred fume hoods.

Second, designers should always consider some form of energy- or heat-recovery system. Using these systems helps reduce the size of the heating and cooling equipment needed in a large lab building, thus saving more energy. Heat recovery is used in five of the case study buildings: three labs use heat wheels, one uses heat pipes, and one includes a run-around coil.

The case studies also point out the importance of assessing and understanding plug loads. One of the buildings was designed for plug loads of 6 watts per net square foot; metering indicates that it is using only 2.7 watts per net square foot (peak). Another building designed for 12 watts per net square foot is also using only 2.7, according to the metering data.

One case study building made use of an energy savings performance contract (ESPC) to replace its aging HVAC system. The ESPC contractor was able to reduce annual energy costs by 60 percent and water consumption by 50 percent. The new systems use state-of-the-art digital controls and VAV supply and exhaust. They also include energy recovery on the exhaust air stream, absorption chillers and heaters, and a 200-kilowatt fuel cell.

The case studies also offer various approaches to providing daylighting and access to outdoor views. Three buildings have higher ceilings close to windows; this design allows natural light to reach farther into the space and reduces the amount of energy needed for electric lights.

The case studies also discuss commissioning, which involves making sure that all installed building equipment and systems are in full working order, according to specifications. Building commissioning and periodic recommissioning of energy-efficient equipment are both important to ensure continued savings. In three of the case studies, third-party commissioning is described. One study includes a good discussion of the importance of ongoing recommissioning of the building's systems.

Finally, because the people who work in labs are also key to efficient operations, one Labs21 case study discusses the importance of educating the staff about the building's efficiency measures. By educating the staff, they can be fully aware of the effects of their work habits and practices on energy and water use.

*To learn more, review the case studies at [www.labs21.lbl.gov/cs.html](http://www.labs21.lbl.gov/cs.html) or please contact Nancy Carlisle at 303 384-7509 and [nancy\\_carlisle@nrel.gov](mailto:nancy_carlisle@nrel.gov) or Otto Van Geet at 303 384-7369 and [Otto\\_VanGeet@nrel.gov](mailto:Otto_VanGeet@nrel.gov), both at the National Renewable Energy Laboratory.*



# A Tool to Assess Laboratory Energy Performance

The inherent complexity and variety of laboratory types makes comparative assessments and benchmarking of their energy performance a unique and challenging task, when compared to most other building types. Recognizing this challenge, the Labs21 program initiated the development of a national database of laboratory energy performance. This project has three main components.

**Metrics:** Labs21 has developed a standard set of energy performance metrics that can be commonly used in the design, commissioning, and operation of laboratories (see Table 1). The metrics include both energy use (e.g., kilowatthours per square foot per year) as well as system efficiency (e.g., watts per cubic foot per minute). This set of metrics is intentionally not comprehensive, since the goal was to develop a limited set of key metrics that allow for effective assessment of energy efficiency, without unduly burdensome data collection requirements.

**Database Tool:** A web-based database tool has been developed to collect, analyze, and display benchmarking data. The tool allows a user to input laboratory characteristics and energy use data via conventional web forms. Password-protected input ensures that the information remains anonymous to other users of the database. Although measured data are preferred, estimated data may also be provided, and the user can indicate this accordingly. Figure 1a shows a portion of the data input form.

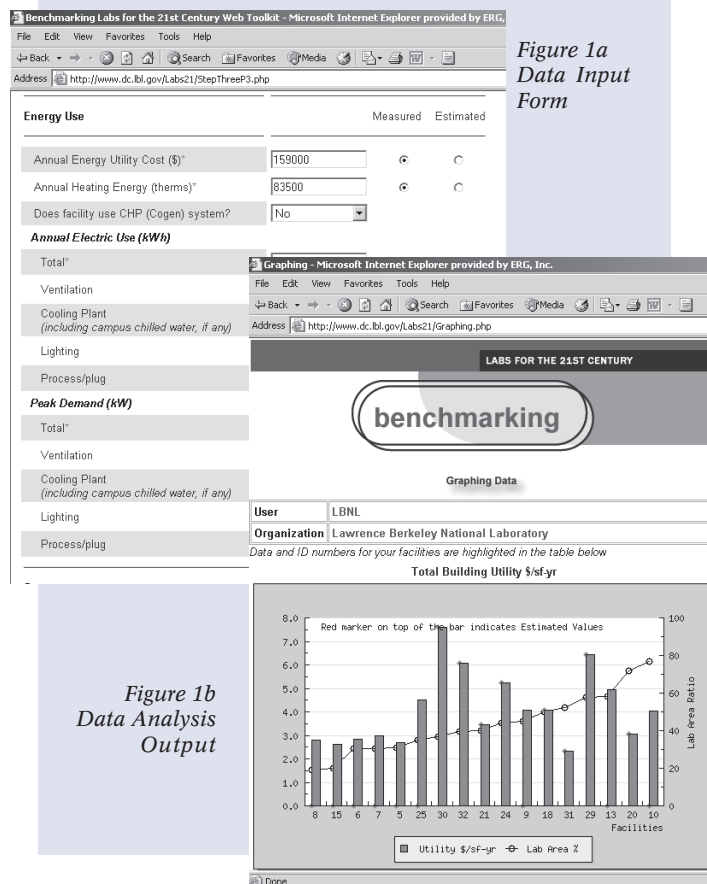
**Data Collection and Analysis:** To perform data analysis using the database tool, the user specifies a metric of interest, and can set criteria to filter the data set by lab-area ratio, occupancy hours, and climate. The tool then presents the data analysis in graphical and tabular format, as shown in Figure 1b. The database currently has data from about 35 private and public sector laboratory facilities, including Labs21 Pilot Partners. Some of the key findings from the data analysis are:

- There is a wide variation in total energy use intensity, and a relationship between this intensity and lab-area/gross area ratio, weather, and hours of operation.
- Based on the magnitude of peak electrical loads and their relationship to plug load assumptions, the data suggest that plug loads are often overestimated in design, resulting in oversized HVAC equipment.
- There are numerous efficiency opportunities in the ventilation system, as indicated by metrics such as W/cfm (Watts per cubic foot/minute).

Labs21 encourages laboratory operators to use the database to compare their facilities with other facilities using these metrics. Toward this end, Labs21 works with laboratory operators to input data into the database and benchmark their facilities.

**Table 1**  
Standard set of laboratory energy metrics

System	Metric
Ventilation	• kWh/sf-yr • Peak W/cfm • Peak cfm/sf (lab) • Avg cfm/peak cfm
Cooling	• kWh/sf-yr • Peak W/sf • Peak sf/tons
Lighting	• kWh/sf-yr • Peak W/sf
Process/Plug	• kWh/sf-yr • Peak W/sf
Heating	• BTU/sf-yr
Total Building	• kWh/sf-yr (total elec) • BTU/sf-yr (site) • BTU/sf-yr (source) • Utility \$/sf-yr • Peak W/sf • Effectiveness (Ideal/Actual)



**Figure 1b**  
Data Analysis Output

The Labs21 Benchmarking Tool can be accessed on the web at [www.dc.lbl.gov/Labs21/Labs21intro.php](http://www.dc.lbl.gov/Labs21/Labs21intro.php). For questions and comments, please contact Paul Mathew of the Lawrence Berkeley National Laboratory at 202 646-7952 or [PAMathew@lbl.gov](mailto:PAMathew@lbl.gov)

# Capturing and Tracking Energy-Saving Project Goals with the Design Intent Tool

Successful implementation of energy-saving building technologies in laboratories is often thwarted by the absence of explicit direction from the building owner, misunderstandings and different visions among members of the design team, and ambiguous performance targets. The lack of clarity created by these problems, in turn, hampers the post-construction commissioning and measurement and verification processes of laboratories. To help prevent these problems, DOE's Lawrence Berkeley National Laboratory developed a comprehensive new tool, the Design Intent Tool, which allows project managers to document the design intent beginning in the early stages of a project. The tool helps facilitate a robust new approach to laboratory design, increasing the likelihood of meeting desired energy savings goals.

## Documenting Design Intent

Design documents evolve as a project moves through the phases of programming, design, and construction, into building occupancy and potential future renovations and retrofits. Important decisions are made at each stage and they all merit documentation. Ideally, quantifiable metrics are defined at the outset that measure the success of the design and its implementation in meeting the project's objectives.

Design intent documentation is crucial to verifying the proper installation, operation, and performance of energy efficiency features, and is the essence of communication and contractual obligations among the project team members.

## Benefits—Why Document Design Intent?

A building design process devoid of quantitative feedback is unlikely to detect or correct problems. Documenting design intent captures and preserves key information across the building's life cycle, helping to ensure that:

- Project participants are able to clearly document desired performance objectives during planning phases.
- Evaluations of proposed design options are better supported and the resulting decisions (including rejection of recommendations) are better documented and shared among design team members.
- Assessment of design changes during construction and operations and maintenance (O&M) is improved.
- The commissioning process is more comprehensive and cost-effective when supported by access to clearly-specified performance targets.

- O&M evaluation of the day-to-day system performance and early detection and diagnosis of maintenance problems are enhanced through performance benchmarking.
- Performance contracting and measurement and verification are supported in a structured and proactive manner.
- Post-occupancy evaluation is more easily performed.
- Critical information is not lost when a facility changes hands.

## The Design Intent Tool

At the heart of the Design Intent Tool is a framework in which design goals for energy or other systems can be described in terms of Objectives (overall goals), with subordinate Strategies (specific means of achieving the goals), and Metrics (measurable performance targets).

This tool helps users document design intent through a series of reports (in MS-Word and MS-Excel format), including a "Data Tracker" module to ensure that the owner's goals are periodically verified through performance measurement. Optional templates for laboratory-type facilities and LEED™ "green buildings" guidelines are packaged with the tool, which can be modified if desired.

The tool was tested with proposed cleanroom and laboratory facilities at DOE's Sandia National Laboratory, NOAA's National Fisheries Marine Service, the Honolulu Laboratory Renewal Project, and a physical sciences laboratory at the University of California-Santa Cruz. Most recently, it was applied to a planned Science and Engineering laboratory on the University of California-Merced campus, and greatly benefited the overall design documentation process.

The Design Intent Tool is a key element of the Labs21 Tool Kit, supporting the program's mission to facilitate sustainable laboratory design. The tool was developed by the Applications Team at DOE's Lawrence Berkeley National Laboratory, with primary sponsorship from the California Energy Commission. The California Institute for Energy Efficiency sponsored initial conceptual development of the tool. Portland Energy Conservation, Inc. collaborated on an earlier version of the tool.

*To learn more and download a free copy of the tool, see <http://ateam.lbl.gov/DesignIntent/home.html>.*

## Berkeley Lab's High-Performance Fume Hood Reduces Energy Use By 50 Percent

More than 500,000 fume hoods are used in the United States by high-tech industries, hospitals, universities, and research facilities to help keep workers safe; but the devices can use a lot of energy—a single fume hood running 24 hours per day uses as much energy as three entire houses. New energy-efficient fume hood technology developed by DOE's Lawrence Berkeley National Laboratory is expected to reduce the energy-intensive demands of laboratory ventilation systems. Berkeley Laboratory's promising new fume hood technology reduces airflow requirements by 50 to 70 percent while maintaining or even enhancing worker safety. The new technology has been demonstrated successfully in testing at Berkeley Laboratory and at the University of California, San Francisco's Department of Pathology.

Berkeley Laboratory researchers estimate that the new technology could save 8,000 gigawatthours of electricity in the United States. The annual electricity cost savings per hood is about \$2,100. "This invention improves user safety while reducing both energy use and the size of mechanical systems required to provide adequate heating, ventilation, and cooling," said Berkeley Laboratory's Dale Sartor, one of the fume hood's developers and Head of the Environmental Energy Technologies Division's Application Team.

Fume hoods are box-like structures often mounted at tabletop level with a movable window-like front called a sash. The devices capture, contain, and exhaust hazardous fumes created during industrial processes or laboratory experiments. Generally, fumes are drawn out of a hood by fans through a port at the top of the



*Prototype High Performance Berkeley Hood installed at the University of California, San Francisco.*

hood. The energy to filter, move, cool, or heat, and in some cases scrub (clean) this air is one of the largest loads in most laboratory facilities.

The patented Berkeley Laboratory design uses a "push-pull" approach to contain fumes and exhaust them from the hood. Small supply fans located at the top and bottom of the hood's face push air into the hood and into the user's breathing zone, setting up a "divider" of air at the sash. The air divider helps prevent fumes from reaching a user standing in front of the hood. Consequently, the exhaust fan can be operated at a much lower flow. The new design has reduced the flow down to 30 percent of a typical hood installation. "Fume hoods typically require large exhaust flows and are usually never turned off, so they use a tremendous amount of energy both in fan power and

in heated and cooled room air," said co-developer Geoffrey Bell. "The hood could save industrial facilities hundreds of thousands of dollars a year in energy and initial costs of construction."

The prototype high-performance fume hood installation at the University of California's, San Francisco laboratory is one of three prototypes currently being tested in the United States. "We are thrilled with the success of this field test," Mr. Sartor said. "We are working with industry partners to continue the development and refinement of the technology." He added that before the new hoods can be widely applied, institutional and regulatory barriers also need to be overcome. Tek-Air, a leading laboratory controls company, is planning to introduce a commercial version of the Berkeley High-Performance Fume Hood later this year.

The high-performance technology was developed by Helmut Feustel and Bell. The team includes Sartor, Chris Buchanan, Darryl Dickerhoff, William Fisk, and Doug Sullivan.

The demonstration and field-testing of the high-performance fume hood was funded by Pacific Gas & Electric. Research and development of the technology was supported by DOE, the California Energy Commission, and the California Institute for Energy Efficiency.

*For more information, see <http://ateam.lbl.gov/hightech/fumehood/fhood.html> or please contact Geoffrey Bell of LBNL at 510-486-4626 or [gcbell@lbl.gov](mailto:gcbell@lbl.gov), or Dale Sartor of LBNL at 510-486-5988 or [DASartor@lbl.gov](mailto:DASartor@lbl.gov).*



# States and Cities Follow Federal Lead in Energy-Efficient Purchasing

FEMP's mission to "Lead by Example" is gaining headway in a very important market segment—state and local government. A growing number of jurisdictions have followed the federal government in adopting energy-efficient purchasing policies, often using the same ENERGY STAR® and FEMP criteria that federal agencies are required to use.

The State of Arizona and New York City are only two of the most recent additions to a growing list of states, cities, universities, and school districts that are choosing to "buy efficient," often as part of a broader policy to "buy green" (i.e., choose environmentally-preferable and recyclable products). According to the Consortium for Energy Efficiency (CEE), the 50 state governments and approximately 3,043 county, 19,279 city, and 16,656 town governments together spend an estimated \$12 billion per year on energy bills and another \$50 to \$70 billion a year on energy-related products. The magnitude of this buying power can help jump-start a market transformation toward energy-efficient products.

When major buyers at all three levels of government use the same efficiency criteria to specify energy-efficient products, this sends a powerful market signal to manufacturers and vendors that some of their largest and most important customers are committed to buy high-efficiency products—and are looking for sellers who can offer the best prices and the best overall value for these efficient products.

In other words, aggregating buyer demand for energy-efficient products will stimulate competitors to respond. This, in turn, helps to lower prices and improve choices for all buyers of energy-efficient products, government and non-government alike.

A recent report prepared for FEMP by DOE's Lawrence Berkeley National Laboratory (LBNL) suggested that federal, state, and local purchasing combined could save U.S. taxpayers about \$1 billion per year in lower energy bills—simply by replacing standard, minimal-efficiency products with more efficient (ENERGY STAR® or FEMP-recommended) models. These annual savings can be realized, after 10 years of turnover, for the most part using funds that will be spent anyway, to replace equipment at the end of its useful life.

As many *FEMP Focus* readers are aware, both Executive Order 13123 and FAR (Part 23) direct federal agencies to buy ENERGY STAR® labeled products or (for categories where there is no ENERGY STAR® label) to choose FEMP-designated products that are among the 25 percent most energy-efficient on the market. A separate requirement, signed in 2001 by President Bush (EO 13221), calls on federal agencies to buy products that use up to 1 watt in standby (off) mode, or other low standby levels set by FEMP. Both Executive Orders provide for exceptions if there is no efficient product available to meet the agency's functional requirements, or if an efficient product would not be cost-effective for some specific application.

In Arizona, Governor Janet Napolitano signed a new law (HB 2324), sponsored by State Representative Randy Graf. The new law, enacted last April, sets goals for reducing overall energy use in state government and university buildings, similar to the federal building goals in the 1992 Energy Policy Act and subsequent Executive Orders. The Arizona law also requires new construction to be more energy-efficient, and mandates that:

"All state agencies shall procure energy efficient products that are . . . ENERGY STAR®

[labeled] or that are certified under the Federal Energy Management Program . . . unless the products are shown not to be cost-effective on a life-cycle cost basis." (Arizona Statute, HB 2324)

According to Jim Westberg of the Arizona Department of Commerce Energy Office, "This new purchasing policy is really a great benefit to our state agencies, since we also have a goal of reducing energy use 10 percent by 2008. When the agencies start buying efficient models as part of their normal equipment replacement cycle, it will help them reach that goal." Taken together, these initiatives will save Arizona taxpayers about \$90 million over a 12-year period, from now to 2015, according to estimates by the Southwest Energy Efficiency Project (SWEET).

New York State is now implementing both an Executive Order and a state law requiring state agencies to buy energy-efficient products. Executive Order 111, signed by Governor Pataki during June 2001, calls for:

- a 35 percent reduction in energy use by state buildings as of 2010 (using a 1990 base),
- new buildings that meet LEED™ rating criteria and are at least 20 percent more efficient than New York Building Code requirements, and
- purchase of ENERGY STAR® products or other efficient products as designated by the New York State Energy Research and Development Authority (NYSERDA).

In carrying out this purchasing mandate, NYSERDA has drawn heavily on the federal procurement criteria set by FEMP. Matt Brown, who heads NYSERDA's implementation of the Executive Order, observed that: "Many of the purchasing

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### STATES AND CITIES FOLLOW FEDERAL LEAD IN ENERGY-EFFICIENT PURCHASING

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officials I've spoken to have always wanted to purchase equipment with higher standards; now the Executive Order gives them the guidance and the go-ahead to do it."

New York City recently enacted legislation that codifies its practice of energy-efficient purchasing, a practice dating from 1994. Local Law No. 30, signed into law by Mayor Michael R. Bloomberg on April 11, 2003, requires that energy-using products procured by the City of New York be ENERGY STAR® labeled, provided that there are at least six manufacturers that produce such ENERGY STAR® products.

In energy-efficient purchasing, the New York City (NYC) clearly leads by example. During FY 2002, NYC spent \$90.8 million for ENERGY STAR® labeled products. Of this, more than three-fourths was for computers, monitors, and printers, with the rest spent on photocopiers, fax machines, televisions, VCRs, air conditioners, and lamps—and the total does not even include energy-efficient equipment installed as part of construction and renovation projects.

According to Jennifer Blum at the Department of Citywide Administrative Services (DCAS), NYC's primary purchasing agency for goods, "New York City firmly believes that in our role as a market participant we should promote the purchase of energy-efficient products." For several years, DCAS has provided training to other NYC agencies on energy-efficient and environmentally preferable purchasing. NYC procurement staff also believe that the online listing of ENERGY STAR® qualified products ([www.energystar.gov/products](http://www.energystar.gov/products)) offers a valuable source of information to meet the requirements of the local law.

The State of California Department of General Services issued a Management

Memo on "Procurement of Energy Efficient Products" (Memo 01-14, July 20, 2001) listing the FEMP product categories and directing that: "Where FEMP-recommended standards are available, all state agencies shall purchase only those products that meet the recommended standards. All products displaying the ENERGY STAR® label meet the FEMP standards. A purchase of an ENERGY STAR®-labeled product automatically complies with this directive."

DGS guidelines for major capital construction projects also require that equipment, appliances, and roofing systems purchased as part of new construction or renovation are ENERGY STAR® compliant. "California state government invests over \$3.8 billion annually in design and construction," said Dan Burgoyne, Sustainability Manager at the CA Dept. of General Services. "California already has some of the most stringent energy codes in the country (Title 24), and the use of ENERGY STAR® products has helped state projects meet and sometimes exceed these stringent energy codes by up to 30 percent."

Meanwhile, the statewide University of California system already specifies ENERGY STAR® office equipment, and is considering ways to extend its energy-efficient purchasing into one of the fastest-growing areas of procurement: energy-using equipment in the Universities' many existing and new laboratory facilities. Energy use by lab equipment, also an important issue for many other universities, private firms, and federal agencies, will be explored at a special panel session at the upcoming Labs-21 Conference in Denver (October 2003), cosponsored by FEMP and the Environmental Protection Agency.

Also in California, during July 2003 the San Diego Regional Energy Office conducted a workshop on Procuring Energy Efficiency Products for local government purchasing managers, engineers, architects, facility managers, and policymakers.

The workshop featured case studies on energy-efficient purchasing by the cities of San Diego and Inglewood, as well as speakers describing the FEMP procurement and ENERGY STAR® labeling programs.

In Wisconsin, the Department of Administration, Division of Energy works closely with other state agencies, the University of Wisconsin (UW), city governments, and local Public Housing Authorities to encourage widespread use of ENERGY STAR® and FEMP efficiency criteria in government purchasing. Just this summer, staff at the Division of Energy noticed that the University System was about to issue a major solicitation for compact refrigerators for the dormitories. According to Barbara Smith of the Division of Energy, "Several of the manufacturers made ENERGY STAR® compact refrigerator/freezers in the size needed, so the UW buying agent agreed with my suggestion to amend the bid specs to require ENERGY STAR®."

Similarly, the Wisconsin Department of Revenue was so intrigued with the possibility of specifying high-efficiency light-emitting diodes (LED) lighted "LOTTERY" signs for use by small retail stores that they decided to revamp their bid specifications to mandate LEDs. Again according to Smith, "When the bids came in, the Department was very pleased with the price and performance." Local governments in Wisconsin have also made effective use of the statewide contract for high-efficiency LED traffic signals to negotiate attractive prices from local dealers.

Among the next targets are ENERGY STAR® refrigerators, clothes washers, and room air conditioners—the latter are purchased in volume (about 400 per year by UW-Madison alone) for dorm rooms used by summer conference attendees. Also, Smith thinks that the new FEMP and ENERGY STAR® criteria for efficient food service equipment will be very popular with universities and school districts alike.

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To cite a few more examples of the many other states and municipalities with energy-efficient purchasing policies:

- The City of Seattle's "Lean and Green City" Copernicus Project for purchasing calls for office equipment to meet ENERGY STAR® requirements ([www.ci.seattle.wa.us/oem/GreenPurchasing/GreenPurchasing.htm](http://www.ci.seattle.wa.us/oem/GreenPurchasing/GreenPurchasing.htm)).
- King County in Washington State has purchased 32 hybrid electric vehicles for the county government fleet, under a master contract issued by the State of Washington. The County reported that the purchase price for these hybrids, with twice the fuel economy of the average new car, was about the same as what they paid for conventional sedans.
- The Commonwealth of Massachusetts has an Environmentally Preferable Products Procurement Program (EPP) that features ENERGY STAR® labeled appliances, air conditioners, and office equipment, as well as links to the FEMP and ENERGY STAR® web sites.
- Although last updated during 2000, the Consortium for Energy Efficiency Web site for State and Local Government Purchasing lists case studies, including: Portland, OR; San Antonio, TX; San Francisco, CA; St. Paul, MN; Hennepin and Ramsey Counties, MN; Bexar County and Harlandale School District, TX; Montgomery County, MD; University of California San Francisco; University of Washington-Seattle; and state governments in Idaho, Massachusetts, and Tennessee.

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- Consortium for Energy Efficiency: [www.cee1.org/gov/gov-main.php3](http://www.cee1.org/gov/gov-main.php3)
- ICLEI (International Council for Local Environmental Initiatives): [www.iclei.org/europe/ecoprocura/northamerica/en\\_star.htm](http://www.iclei.org/europe/ecoprocura/northamerica/en_star.htm)
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- Arizona: [www.swenergy.org/legislation/arizona/HB2324\\_bill\\_text.pdf](http://www.swenergy.org/legislation/arizona/HB2324_bill_text.pdf)
- California: [www.documents.dgs.ca.gov/osp/sam/mmemos/mm01\\_14.pdf](http://www.documents.dgs.ca.gov/osp/sam/mmemos/mm01_14.pdf)
- Massachusetts: [www.state.ma.us/osd/enviro/products.htm](http://www.state.ma.us/osd/enviro/products.htm)
- New York State: [www.nyserda.org/exorder111.html](http://www.nyserda.org/exorder111.html) and [www.nyserda.org/equipstds.html](http://www.nyserda.org/equipstds.html)
- New York City: [www.council.nyc.ny.us/pdf\\_files/bills/law03030.pdf](http://www.council.nyc.ny.us/pdf_files/bills/law03030.pdf)
- Washington State: [www.energyideas.org/documents/factsheets/Proc\\_Resources.pdf](http://www.energyideas.org/documents/factsheets/Proc_Resources.pdf)
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- Wisconsin: [www.focusonenergy.com/page.jsp?pageId=286](http://www.focusonenergy.com/page.jsp?pageId=286)

## New FAR Requirement to Buy Low Standby Power Devices

A new provision in the federal Acquisition Regulations (FAR) as of July 24, 2003, sets forth requirements for federal agencies to buy energy-efficient standby power devices in accordance with Executive Order 13221.

That Order, signed by President Bush in July 2001, directs agencies to "...purchase products that use no more than one watt in their standby power consuming mode" whenever this is life cycle cost-effective and practical. If products with one watt standby are not available, agencies are to seek products with other low power use in standby mode. This is in addition to the existing FAR requirements to buy ENERGY STAR® products; the ENERGY STAR® label covers most product categories with standby power use.

To implement the Executive Order, FEMP has worked closely with the General Services Administration, Defense Logistics Agency, and other agencies as well as industry representatives. FEMP-recommended levels for low-power standby are shown on the FEMP procurement web site ([www.eere.energy.gov/femp/procurement/](http://www.eere.energy.gov/femp/procurement/)). A list of products that meet the FEMP low-standby criteria is at <http://oahu.lbl.gov/>.

The new FAR requirements were published in the federal Register on July 24, 2003 (pp. 43857-9, FAR Case 2001-28, Item II - see [www.acqnet.gov/far/FAC/fac2001-15.pdf](http://www.acqnet.gov/far/FAC/fac2001-15.pdf)).

*For more information please contact Alison Thomas, FEMP, at [alison.thomas@ee.doe.gov](mailto:alison.thomas@ee.doe.gov).*



## Are You Using the GSA Energy Services Schedule?

If not, maybe you should be! This valuable resource provides federal energy managers contract support for energy audits, program support, and purchase of electricity and natural gas. The General Services Administration (GSA) Energy Services Schedule also helps managers comply with energy reporting requirements and goals through a variety of contracts. By using contractors on this schedule, you can save money and time.

The process is very simple. A contracting officer sends a request for a quote—which includes your performance-based statement of work—to three or more schedule contractors. You may tell your contracting officer which contractors on the schedule you prefer. After quotes are received, you simply evaluate your responses for best value, and send a task order to your selection.

Contractors on this schedule are knowledgeable and experienced in energy management processes and have demonstrated they are capable of providing expert assistance to agencies striving to meet their energy efficiency goals. Advantages of using this and other federal Supply Schedules include:

- Easy access to commercially-available services,
- Multiple awards for varying requirements,
- Open market requirements are not needed,
- Prices have been determined to be fair and reasonable, and
- In most cases, the government purchase card can be used when placing orders.

The Energy Services Schedule was designed specifically to meet the goals of Executive Order 13123, and includes the following program areas:

- Energy Management Program Support,
- Energy Audit Services,
- Managing the Procurement and Use of Natural Gas,
- Managing the Procurement and Use of Electricity,
- Managing the Procurement and Use of Energy from Renewable Sources, and
- Introduction of New Services.

*For complete information on the GSA Energy Services Schedule, visit the GSA web site at [www.gsa.gov](http://www.gsa.gov), and click on “Buying Through GSA.” The Energy Services Schedule is under “Environmental Products and Services.” The Schedule contains a summary of services, information on finding available contractors, procedures for ordering services priced at hourly rates, and sample forms.*

## Life-Cycle Costing + BLCC5 = Cost-Effective Projects

When you fund an energy efficiency improvement project at your agency from appropriations, you probably routinely consider a life-cycle cost effectiveness evaluation in your design and construction planning. But you may think that there is no need for it if your project is financed through an energy savings performance contract or a utility energy services contract. After all, you are not spending any money; it is all paid for by the cost savings the project is expected to generate. So why should you care?

You should care because:

- (1) Executive Order 13123 requires projects to be life-cycle-cost (LCC) effective. It says so 26 times in its 11 pages. LCC effectiveness means that not only do you want to save at least as much as you invest, you want to select those measures that give you the greatest possible net savings.
- (2) You want to understand how, for example, bundling less cost-effective or non-cost-effective ECMs with ECMs that generate maximum savings affects the length of your contract term and thus your interest rate and your financing costs. You want to understand how your first-year energy cost savings might change over the contract period, and whether at the end of the study period there will be any useful life left in the equipment you are installing. You can do an LCC analysis yourself or you can make sure that you understand the results of the LCC analysis that is performed by your energy services company or utility contractor.
- (3) The more information you have available about the expected LCC of your project, the better will you be able to negotiate the most advantageous deal for your agency.

FEMP has the tool to help you perform an LCC analysis. The Building Life-Cycle Cost Program, BLCC5, version 5.1-03, contains a module dedicated to evaluating financed energy and water conservation and renewable energy projects in accordance with 10 CFR 436A, as required by Executive Order 13123. The program is updated every year on April 1 with the latest energy price escalation rates of the DOE Energy Information Administration and the most recent FEMP discount rates. You may download it free of charge from the FEMP web site at [www.erec.energy.gov/femp/techassist/softwaretools/softwaretools.html](http://www.erec.energy.gov/femp/techassist/softwaretools/softwaretools.html).

*NIST (National Institute of Standards and Technology) Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program, and its Annual Supplement, Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis, explain the principles of LCC analysis and their application to energy and water conservation projects. You may request copies from the DOE Help Desk (1-800-DOE-EREC). FEMP also conducts workshops to teach the LCC methodology and the use of BLCC5. For details, please consult the FEMP web site under “Resources” and click on “Training”.*

*For further information on the LCC method and BLCC programs, please contact Sieglinde Fuller of NIST at [sieglinde.fuller@nist.gov](mailto:sieglinde.fuller@nist.gov).*

# Whole Building Design Approach is Here to Stay

A few years ago, federal agencies were issued Congressional and Executive Branch guidance which mandated that the various agencies engaged in designing federal buildings work more closely together. Because of the size and complexity of federal government agencies, and their design and construction processes, this mandate required a paradigm shift and listening and learning about the various processes. At the time that the Unified Design Guidance was issued, the Naval Facilities (NAVFAC) Criteria Office and the Sustainable Buildings Industries Council were pursuing the same idea. From these discussions, the concept of the Whole Building Design Guide (WBDG) web site was born. The WBDG was initially intended to be a continually evolving resource that would educate and inform architects, engineers, and project managers in sustainable, or environmentally sound, building design. The website has grown and been expanded to provide additional information regarding building safety, security, accessibility, aesthetics, durability, cost-effectiveness, historic value, function, and workplace productivity. As the website has evolved, the many agencies that support it and its content are seeing positive changes in how their operations are run, and how they access and share valuable information. The WBDG contains concise summaries of topics and links to more detailed information. This has enabled the WBDG to become the single point-of-entry Internet resource for design guidance, criteria, and technology for “whole buildings.” The WBDG makes the search for this valuable information easy and quick because it is knowledge-based, dynamic, fluid, has order, and allows for human interaction.

Dennis Talton, an architect and Special Assistant for Architecture and Accessibility within NAVFAC, commented on the importance of the web site in his daily work. With a small headquarters office serving field offices located in places as varied as Chicago, IL; Norfolk, VA; San Diego, CA; Hawaii; and, Naples, Italy, it is imperative that his office provide consistent and comprehensive information to those field offices. Like many agencies and businesses that have seen budget and staff reductions, they are trying to do a lot of work with limited resources. They accomplish this goal by posting their own, up-to-date information, which is usually applicable to other agencies, on the WBDG and directing the field offices to access information at the site. Talton believes that the Design Objectives and Building Types pages are the greatest value to designers. These pages are valuable because they are complete and comprehensive sources of information that every building designer must incorporate into their design process to produce a holistic building approach that will serve occupants most effectively.

*The WBDG web site condenses the vast amount of data regarding building design, products and systems, and project management into usable, up-to-date information.*

Debbi LoCicero, Senior Architect at the National Institutes of Health, utilizes the WBDG web site to develop design and construction policy. She references the Design Guidance and Design Objectives pages when she is writing a new policy that will improve the way buildings are designed within the NIH system. Her offices have recently undergone a re-organization, so efficiency is crucial to accomplishing her work. LoCicero, like many other users of the WBDG, appreciates its clear, concise, easy-to-follow method of accessing information. Her work on the WBDG has also broadened the horizons of her customers, and the A/E firms that design and construct buildings for NIH by educating them about the whole building design approach.

With new information and updates posted and planned for the site, WBDG will continue to help those looking for resources to help them solve the complexities of designing a building to meet all of today's and tomorrow's “whole buildings” requirements. If you are already a user of the WBDG but haven't been to the site in a while, or are a new user, we invite you to see what's new at the web site. Simply log onto [www.wbdg.org](http://www.wbdg.org) and start learning!

## To Learn More about the WBDG

The WBDG web site condenses the vast amount of data regarding building design, products and systems, and project management into usable, up-to-date information. Functioning as a “vertical portal,” the WBDG enables users to access increasingly specific information by navigating down two major categories:

### *Design Guidance:*

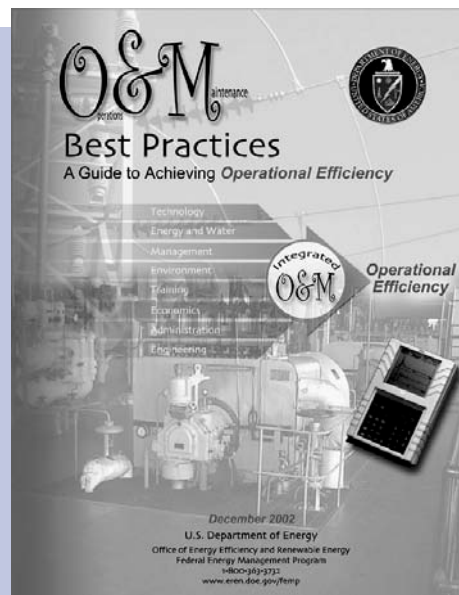
- Building Types;
- Design Objectives: Accessible, Aesthetic, Cost-Effective, Functional, Historic, Productive, Safe/Secure, Sustainable; and
- Products and Systems.

*continued on page 20*

## FEMP's O&M Best Practices Guide: A Guide to Achieving Operational Efficiency

FEMP's *Operations and Maintenance Best Practices Guide* highlights cost-effective operations and maintenance (O&M) measures for ensuring reliability, safety, and energy efficiency for systems and equipment typically found at Federal facilities. O&M programs targeting energy efficiency can save 5 to 20 percent on energy bills without a significant capital investment. Depending on the Federal site, these savings can represent thousands to hundreds-of-thousands of dollars each year, and many can be achieved with minimal cash outlays. In addition to energy and resource savings, a well-run O&M program will:

- increase the safety of all staff because properly maintained equipment is safer equipment;
- ensure the comfort, health, and safety of building occupants through properly functioning equipment, providing a healthy indoor environment;
- confirm that the design life expectancy of equipment is achieved; and,
- facilitate compliance with Federal legislation such as the Clean Air Act and the Clean Water Act.



FEMP's O&M guide is designed to provide the Federal O&M/energy manager and practitioner with information and actions aimed at achieving these savings and benefits. The guide outlines major O&M program types and state-of-the-art maintenance technologies and procedures for key equipment, and much more. DOE's Pacific Northwest National Laboratory developed the guide for FEMP and will periodically update the guide as new procedures and technologies are developed and employed. The guide is available on FEMP's web site at [www.eere.energy.gov/femp/techassist/om\\_guide.htm](http://www.eere.energy.gov/femp/techassist/om_guide.htm).

*For more information about FEMP's O&M Best Practices Guide, please contact Greg Sullivan of PNNL at [gp.sullivan@pnl.gov](mailto:gp.sullivan@pnl.gov). For more information on FEMP's O&M Initiative, please contact Ab Ream of FEMP at 202-586-7230 or [ab.ream@ee.doe.gov](mailto:ab.ream@ee.doe.gov).*

### WHOLE BUILDING DESIGN APPROACH IS HERE TO STAY

*(continued from page 19)*

#### *Project Management:*

- Delivery Methods,
- Cost Management,
- Commissioning.

At the core of the WBDG are resource pages containing summaries of particular topics written by industry experts. WBDG is also a powerful, intelligent interface for the National Institute of Building Sciences' Construction Criteria Base (CCB), the single integrated source of all federal facility criteria. DOD personnel can access private sector standards directly through the Information Handling Service via the WBDG. Other features include agency-specific information; news, events, and training;

links to relevant federal mandates; and contact information for trade associations.

The WBDG is managed by the National Institute of Building Sciences through funding from the NAVFAC Criteria Office, the General Services Administration, the Department of Energy and with support from the Sustainable Buildings Industry Council. A Board of Direction and Advisory Committee, consisting of representatives from more than 25 participating federal agencies, private sector companies, and non-profit organizations, guide the development of the WBDG.

*For more information, contact Stephanie Vierra, Steven Winter Associates, at 301-502-7255, or [suvierra@yahoo.com](mailto:suvierra@yahoo.com).*



# The Next Wave in Lighting Energy Savings

What do most people think of when lighting is mentioned to those involved in energy efficiency? For many energy professionals, lighting energy efficiency opportunities are represented by the T8 lamp and electronic ballast retrofit. While the energy savings opportunities of the T8/electronic retrofit “movement” are undeniable, that particular solution is truly the tip of the iceberg with respect to the benefits of energy efficient lighting.

Lighting technology offers tremendous opportunity. Energy savings often ranges from 25 to 40 percent, while the most aggressive solutions can deliver as much as 75 percent savings. There is also an opportunity to deliver *tangible* non-energy benefits to the occupants of a building, if *thoughtful* consideration is given to design solutions that support comfort, preference, and the task work of the federal workforce. FEMP technical assistance in the area of lighting is designed to support energy professionals in making the most of lighting energy opportunities.

## Lighting Standards Have Changed

A few years ago, the primary metric for lighting was the horizontal footcandle. This is a technical measurement for the amount of light delivered to the horizontal task (such as a desktop or workbench). The Illuminating Engineering Society of North America (IESNA) is the standards-writing organization in the field of lighting, and the IESNA *Lighting Handbook* provided a long list of footcandle requirements for the many and varied types of applications. In 2000, *Lighting Handbook* (9th edition) the lighting standards changed in a profound and fundamental way. No longer are footcandles the only metric. In fact, footcandles are often secondary or tertiary in importance. Chapter 10 of the *Lighting Handbook* now provides a matrix of design requirements for each type of application

*“This edition of the IESNA Lighting Handbook introduces a new, formal system for considering a wide range of lighting design criteria. . . . In engineering terms, the goal is to raise the “minimum standard of care” required of lighting designers.”*

— IESNA Lighting Handbook, 9th edition, 2000.

that must be addressed in order to meet the minimum standard of care. This is a fundamental shift in practice and represents a challenge and opportunity for federal energy managers.

For example, an appropriate design for offices should now include lighting the walls (vertical illuminance) and reducing glare. There are many kinds of glare, and one of the most common offenders is often overlooked. Concerns about reflected glare in the computer monitor screen is less of a concern than it used to be due to the improvements in screen technology. One of the most frequent offenders in current practice is overhead glare. This requires a fundamental shift in strategy for lighting energy savings, as explained below.

Many retrofit solutions are geared toward focusing the light downward with the use of specular reflectors. This was considered an improvement because there was an increase in horizontal footcandles for less energy. However, in the context of the current standards this creates a problem in several ways. First, it can create an experience of discomfort for the occupant

due to the increased intensity of the light overhead. Second, it reduces the amount of light delivered between the fixtures (uniformity). Third, the downward focus of the light reduces the brightness on the walls.

So what are the new solutions that meet the IESNA standards and provide visual comfort and satisfaction for occupants? FEMP technical assistance can help. Consider the following partial list of information and tools prepared to support agencies, energy services companies, and utilities. All of these tools can be found through the FEMP web site at [www.eere.energy.gov/femp/resources/lighting.html](http://www.eere.energy.gov/femp/resources/lighting.html).

- *Energy Effective Lighting Checklist.* A front-and-back checklist to help achieve maximum efficiency while still meeting the current standards.
- *Benefits of Energy Effective Lighting.* This piece describes the non-energy benefits of effective lighting in terms that are understandable by the layperson.
- *Economics of Energy Effective Lighting for Offices.* This 4-pager provides comparisons of several design solutions with both simple payback and federal savings-to-investment ratios.
- *FEMP Lights Basic Training.* This web-based course is recommended for anyone who is managing or delivering a federal lighting project.
- *Web-based Occupant Satisfaction Tool.* Use this tool to measure the satisfaction of building occupants—identify problems or capture project-related satisfaction improvements.

There are some lighting challenges that require assistance geared specifically

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*Strategy to reduce overhead glare; South Admin Area—National Laboratory Center; Bureau of Alcohol, Tobacco, Firearms and Explosives; Ammendale, MD.*



*Alcohol Laboratory—National Laboratory Center; Bureau of Alcohol, Tobacco, Firearms and Explosives; Ammendale, MD.*

### THE NEXT WAVE IN LIGHTING ENERGY SAVINGS

*(continued from page 21)*

toward a particular agency or project. For example, many agencies and service providers have not yet updated their boilerplate specifications to reflect the new lighting standards. Certain lighting projects require specialized attention and may merit design assistance. FEMP can provide technical assistance in these areas.

#### FEMP Lighting Partnerships

In addition to the tools and services mentioned above, there are some other resources and services that will help to ensure a successful lighting project. FEMP has been a partner in lighting industry efforts that result in resources and services.

*Advanced Lighting Guidelines.* FEMP has supported the development and maintenance of this landmark technical resource. The 2003 revision has recently been completed, and limited copies of the CD are available through the EREC hotline courtesy of FEMP. The Advanced Lighting Guidelines can be viewed for free on the web at [www.newbuildings.org](http://www.newbuildings.org).

*National Council on Qualifications for the Lighting Professions (NCQLP).* FEMP is a member of the NCQLP. People with “LC” (Lighting Certified) credential have demonstrated an ability to apply fundamental lighting principles and techniques in the NCQLP Lighting Certification exam. Having LC

professionals on federal projects will increase the likelihood of successful lighting solutions. Projects that are especially challenging or unique will benefit from professionals that have lighting design expertise and a portfolio of successful project work.

#### Lighting Technology Opportunities

Lighting technology is evolving at a rapid pace, and there are a number of opportunities that are available but still not commonly installed in federal buildings.

*High performance T8 lamps and electronic ballasts.* There have been significant improvements made to the T8 lamp, and each of the three major lamp manufacturers have high performance lamps with increased lumen output, improved lumen maintenance, longer life, and improved color rendering. There have also been numerous improvements in electronic ballast technology. Paired with the right ballast, this high performance system can save 10 to 20 percent as compared to a standard T8/electronic ballast system. In some cases, this may even merit a retrofit of a system that has already been retrofitted from T12 lamps to standard T8.

*Task-ambient lighting with T5 lamps and semi-indirect pendant fixtures.* Indirect

lighting provides a tangible improvement in the lighted environment, but historically has been out of reach for federal facilities for cost reasons. In recent years, costs have dropped dramatically and semi-indirect steel fixtures are available at the same installed cost as parabolic 2x4 fixtures. The new T5 lamps are more efficient with respect to lumen output and photometric availability, and so the fixtures can often be placed 15 feet on center, which is a significant reduction in connected load. It is acceptable to provide a reduced horizontal illuminance of 35 to 40 footcandles, but only if an articulated (moveable arm) desktop task light with compact fluorescent lamps is made available.

*Lighting controls.* Lighting controls are a tremendous energy savings opportunity. It is critical to find the right solution for your occupants. Maintenance and commissioning are a key element of success with lighting controls. Refer to the *Advanced Lighting Guidelines* for more information about lighting controls.

To summarize, it's clear that coming up-to-speed with respect to the newest lighting standards and technologies is an opportunity that we can't afford to miss.

*For more information, please contact Carol Jones of PNNL at 781-895-1013 or [carol.jones@pnl.gov](mailto:carol.jones@pnl.gov).*

# Coping with Drought

Recently there has been much in the news about drought in the United States. Almost every region of this country has suffered to some extent during the past few years, including regions like Florida and Virginia that are not normally associated with water shortages. While recent rain and snowfall may have relieved the drought in some areas, most reservoirs in the West remain at record lows according to the American Water Works Association. An article in *US News & World Report* says it will take more than 3 years of average rainfall to refill many of these reservoirs. Unfortunately the National Weather Service is predicting dry weather and no relief from the drought for most of the West again this year. This will most likely mean a continuation of shortages, rationing, and drought surcharge pricing.

Federal facilities can play an important role in preserving local water resources. They are often a major user of water in their communities, and can “Lead By Example” by demonstrating good water management practices. This is especially true for facilities that have their own water supply. These facilities should not be seen to flout local drought restrictions by, for example, having a beautiful green lawn

when the rest of the community is restricted from watering.

Executive Order 13123 and FEMP can assist facilities in meeting drought restrictions or improving water efficiency in the long-term. The Executive Order resulted in guidelines for developing a water management plan, which should include a drought response plan and working with the local utility. In addition, it requires the implementation of at least four Water Efficiency Best Management Practices (BMPs). The plan and BMP process will help federal facilities identify the best and most cost-effective efficiency options for their facilities. Further information and the list of BMPs can be found on the FEMP web site.

Completing the planning process and BMP implementation will impact water use and costs in the long run; however, there are some steps that facilities can take to immediately reduce water use. Many of the actions are also included in the BMPs.

*For more information on federal water efficiency, please contact Stephanie Tanner of NREL at 202-646-5218 or [stephanie\\_tanner@nrel.gov](mailto:stephanie_tanner@nrel.gov).*



*Boat ramp leading to Barr Lake, CO, is stranded quite a distance from the water due to drought conditions.*

Photo courtesy of Dr. Ken Dewey, High Plains Regional Climate Center, [www.hprcc.unl.edu](http://www.hprcc.unl.edu), October 2002.

## Everyday Good Practices

- Increase employee awareness of water conservation by installing signs encouraging conservation in restrooms and kitchens.
- Read water meters regularly to quickly identify problems.
- Seek employee suggestions on water conservation; prominently locate suggestion boxes and a number to call in case of problems. Promptly respond to problems to encourage employee participation.
- Make sure irrigation water does not run onto paved surfaces.
- Water in the early morning to reduce evaporation. Do not water on windy days.
- Use an automatic rain shut-off device on sprinkler systems.
- Keep grass long during summer months. Never remove more than 25 percent of grass height. Taller grass shades the roots and encourages deeper, more drought tolerant roots.

## Drought Response Measures

- Use limited irrigation water for trees and shrubs. Grass should be the lowest priority since it will recover faster after the drought and can be more easily replaced.
- Use drip or micro irrigation methods to water trees and shrubs.
- Cut back on watering until lawns and shrubs show some stress.
- Stop hosing down sidewalks, driveways, and parking lots.
- Check water supply system for leaks.
- Turn off any unnecessary flows.
- Repair dripping faucets, showers, and continuously running or leaking toilets and faulty irrigation heads.
- Shut off water supply to equipment rooms not in use.
- Turn off continuous flow to kitchen or lab equipment, such as dishwashers and X-ray machines, when not in use.
- Avoid excessive boiler and cooling tower blow down. Monitor total dissolved solids levels and blow down only when needed.



## Western Area Power Administration Unveils Federal Green Power Purchasing Program

The Western Area Power Administration (Western) recently announced a new program designed to increase the renewable power options available to federal agencies. In collaboration with FEMP, Western has developed a program designed to help federal agencies take advantage of the benefits of renewable energy for some or all of their electricity needs.

Through the program, federal agencies can now purchase three renewable energy products:

- renewable power,
- supplemental renewable power, and
- renewable energy certificates (green tags).

Initial marketing efforts for the program are focused on those agencies that have firm power allocations from Western, although any federal agency can purchase the renewable energy certificate option.

Through the renewable power option, Western can buy renewable energy for federal agencies with load within Western's 15-state service territory, whether or not the agency is an existing Western customer. With this option, renewable energy is physically delivered for the agency's use. To allow for power delivery, an agency's existing power supply and transmission arrangements would require modification. Costs would include renewable power generation, transmission, related ancillary services, and program administration. The primary benefits of this product are electricity cost stability and potential lower cost than conventional power generation.

Supplemental renewable energy is also available from Western. This option is available only to existing Western customers. Under this class of service, Western will acquire renewable energy rather than traditional fossil powered generation to supplement firm power deliveries when hydropower resources are low. This product offers energy which either supplements hydropower deliveries and/or replaces some of the firming energy Western purchases with renewable energy. Customers still pay the hydropower price, plus an additional fixed expense for the supplemental renewable energy costs. No new transmission arrangements are required to deliver this power to the customer.

Western can also purchase renewable energy and sell the energy's environmental attributes to a federal customer. These renewable energy certificates, or green tags, can be purchased by federal agencies regardless of location. Under this option, renewable energy is physically delivered to Western's transmission system and

then the green tags are delivered to the purchasing federal agency. A federal agency purchasing a green tag need not be an existing Western firm power customer. There are no transmission costs for the purchase of the green tags and no impact on your existing power supplier. Federal facilities continue to pay for the power needed to meet load from their current supplier without charge.

"We're extremely pleased with Western's leadership in providing new options to federal agencies for purchasing renewable energy," said FEMP's Director Elizabeth Shearer. "This program helps federal agencies meet the current federal goal to derive the equivalent of 2.5 percent of facility electricity load from new renewable energy resources by 2005."

Western's Green Tag Program Manager Bob Fullerton added, "Western's program promises to provide environmental benefits, such as decreased air pollution from fossil fuel-fired power plants, increases national security by lessening agencies' dependence on imported energy, and supports local economic development by creating local jobs and generating local tax revenue. By offering these three products, we hope to aggregate federal needs and make bigger purchases—improving the financial viability of new renewable energy projects."

"Under this initiative, we are partnering with staff working for DOE's Assistant Secretary for Energy Efficiency and Renewable Energy and the Federal Energy Management Program, as well as the National Renewable Energy Laboratory," said Western's Administrator Michael Hacksaylo. Western markets and delivers hydroelectric power and related services within a 15-state region of the central and western United States (Arizona, California, Colorado, Iowa, Kansas, Minnesota, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Texas, Utah, and Wyoming).

### How Do Federal Agencies Sign Up?

Federal agencies interested in renewable power can sign commitment letters with Western detailing the type of product desired, the quantity to be purchased, and the desired price range. Western will then issue a request for proposal. The resulting bids will be reviewed, and if determined to be acceptable, Western will sign a contract with the renewable energy provider and with each of the federal agency site(s).

*For more information, please see [www.wapa.gov/powerm/pmrenpro.htm](http://www.wapa.gov/powerm/pmrenpro.htm). For additional information, please contact Mike Cowan of Western at 720-962-7245 or [cowan@wapa.gov](mailto:cowan@wapa.gov), or Chandra Shah of NREL at 303-384-7557 or [chandra\\_shah@nrel.gov](mailto:chandra_shah@nrel.gov).*

# FEMP Industrial Facilities Assessment Provides Roadmap to Savings for DOE's Waste Isolation Pilot Plant

Led by assessments of conservation opportunities funded by FEMP's Industrial Facilities Initiative, DOE's Waste Isolation Pilot Plant (WIPP) will cut its water usage by 54 percent and compressed air costs by 58 percent annually.

WIPP requested assistance from FEMP through DOE's Denver Regional Office. The technical assistance effort was led by DOE's Oak Ridge National Laboratory with input from DOE's Pacific Northwest National Laboratory. The Industrial Facilities Initiative is a collaboration between FEMP and DOE's Best Practices Program, part of DOE's Industrial Technologies Program (ITP). The FEMP initiative makes ITP's widely recognized technical expertise available to federal industrial facilities, offering plant-wide assessments of energy, waste, and productivity, or energy assessments for targeted systems. Because of FEMP's initiative, ITP's comprehensive approach to evaluating private-sector industrial facilities' energy efficiency and opportunities for improvement is now available to federal industrial facilities.

WIPP's energy manager, James Hedin, had tried for several years to acquire funding for targeted assessments of the compressed air system and water/wastewater facilities, but potential savings initially appeared small, and low-payback conservation projects rarely rate a high funding priority. Using the roadmap to savings provided by FEMP's assessments, WIPP now plans to make the recommended changes. Hedin credits the Industrial Facilities Initiative with opening the opportunity for WIPP to realize

significant cost reductions and to become "a flagship for water reductions for DOE sites."

Four recommended measures will reduce compressed air system costs by about \$40,000 per year, from \$69,000 to \$29,000:

- lowering operating pressure to the appropriate level,
- instituting a leak-prevention program,
- modifying dryer equipment to prevent unnecessary purge, and
- installing a downsized compressor nearer the point of use.

WIPP's motivation to conserve water results more from a sense of stewardship than from cost concerns. WIPP's water is provided at no charge from the City of Carlsbad (in consideration of infrastructure improvements provided by DOE during the construction of WIPP), and energy costs for pumping are low. However, severe drought in the last several years has resulted in reduced allotments to farmers, leading to the failure of some farming operations and a downturn in the local economy. The assessment recommended reducing the capacity of WIPP's on-site wastewater treatment system and other measures that could cut the facility's water use by 54 percent and save an estimated 2.9 million gallons per year.

*For more information on FEMP's Industrial Facilities Initiative, please contact Michaela Martin at Oak Ridge National Laboratory, 865-574-8688, martinma@ornl.gov, or Alison Thomas, FEMP, 202-586-2099, alison.thomas@ee.doe.gov*



*A truck carries three containers to the WIPP site pictured in the distance.*

## Eight Southeast Medical Centers Will Save \$140,000 per Month with Super ESPC

The Department of Veterans Affairs (VA) recently awarded a \$17 million energy savings performance contract (ESPC) that is guaranteed to yield savings of \$140,000 per month for eight medical centers in the Veterans Integrated Service Network centered in Atlanta, GA (VISN7—the Atlanta Network). The delivery order under DOE's Southeast Region Super ESPC, awarded to Ameresco on May 20, 2003, is for 36 energy conservation measures (ECMs) to improve healthcare facilities in Georgia, Alabama, and South Carolina.

Robert Baugh, FEMP Project Facilitator, said this most recent VA investment in energy efficiency is a standout project. "This is a good, comprehensive project and an excellent value for the VA. With an interest rate of only 5 percent and a relatively short term of 10.5 years, finance costs on this project will be unusually low," Mr. Baugh said. Including no-offset and make-whole provisions in the contract helped the VA negotiate the low interest rate. Financing costs were also minimized by paying \$988,000 to Ameresco early in the contract term from cost savings that accrued during the 18-month construction period. These terms decreased the financed amount and made the contract term shorter.

Energy costs for hospitals are normally higher than for other buildings because they operate and require space conditioning 24 hours per day, 7 days a week, and also have special air quality requirements. Opportunities for improving efficiency and cutting costs, however, are proportionally large. Predictably, most of the retrofits and upgrades will be related to the HVAC systems including chiller and boiler plant replacements; motor replacements; VAV conversions; variable speed pumping; chiller heat recovery for preheating of hot water; and steam traps and condensation return system replacements.

ECMs include water conservation measures, and upgrades to lighting and energy management control systems. Substantial cost savings will result from power factor correction and utility rate renegotiation.

Jeff White, VISN7 Infrastructure Program Manager, championed the project and views ESPCs as an important asset for supporting VA's mission. White said, "Meeting the capital needs of a hospital system the size of VA consumes significant resources and must be maintained in order to deliver reliable care to our veterans. Energy savings performance contracting expanded our ability to maintain our infrastructure without additional resources, while at the same time reducing energy consumption."

*"A positive partnering arrangement with the ESCO [energy service company] and technical support made available through the DOE's Super ESPC vehicle and their FEMP Project Facilitator were key components to the successful development of this contract."*

— Jeff White, VISN7 Infrastructure Program Manager, Department of Veterans Affairs

Doug Culbreth of DOE's Atlanta Regional Office credits White with pursuing a strategy for scoping the project that guaranteed maximum benefits to the VA. White used the ESPC to focus improvements on only mission-critical or mission-critical-support areas in the hospitals. White and Ameresco staff then pared down a list of about 140 potential ECMs to the final 38 that were most cost-effective and paid back quickly enough to keep the contract term close to 10 years.

Close cooperation and continual communication kept Ameresco's efforts on the right track and allowed project development to move quickly through the initial and final proposal stages. White said, "A positive partnering arrangement with the ESCO [energy service company] and technical support made available through the DOE's Super ESPC vehicle and their FEMP Project Facilitator were key components to the successful development of this contract."

*For more information about the project please contact Jeff White, VISN7 Infrastructure Program Manager, at 205-554-3826 or [Jeff.White@med.va.gov](mailto:Jeff.White@med.va.gov); or Bob Payne, Ameresco, at 704-916-3505 or [rffpayne@ameresco.com](mailto:rffpayne@ameresco.com); or Doug Culbreth, DOE's Atlanta Regional Office at 919-870-0051 or [Carson.culbreth@hq.doe.gov](mailto:Carson.culbreth@hq.doe.gov).*

*For information about Super ESPCs, please contact Tatiana Strajnic, FEMP Project Financing Team Lead, at 202-286-9230 or [tatiana.strajnic@ee.doe.gov](mailto:tatiana.strajnic@ee.doe.gov); or the FEMP representative in your DOE Regional Office (see [www.eere.energy.gov/femp/financing/espc/getting\\_started.html](http://www.eere.energy.gov/femp/financing/espc/getting_started.html)).*



# Good News About Super ESPCs in New ORNL Study

## Energy Managers Can Use Study Results to Show Cost-Effectiveness of Financing Instead of Waiting for Appropriations

Using appropriated funds for an energy project is always less expensive than financing the same project with an interest-bearing loan—if other things are equal. However, appropriations may be slow to materialize or insufficient to fund priority energy projects. New life-cycle-cost (LCC) studies and methodologies in a report recently published by DOE's Oak Ridge National Laboratory (ORNL) can help federal energy managers evaluate when financing an energy project, and thereby putting energy savings into action sooner, is a better deal for the government than waiting for appropriations.

The authors of the report compared life-cycle costs of using energy savings performance contracts (ESPCs) and appropriations to implement a “typical project,” defined as the average project implemented under the DOE Super ESPC program. The authors found that two of the primary factors in determining energy project life-cycle cost are process time (the time elapsed before the energy project is constructed and saving energy) and costs for surveys and studies required for requesting funding. To accommodate the wide variation in these factors across federal organizations and to allow agencies to customize the study to their own experience, the authors established parameters for the LCC comparisons. The study's results are expressed in LCC tables that compare the “average ESPC” to 288 appropriations cases having survey and study costs ranging from 4 to 26 percent of project cost, and process times ranging from 28 to 74 months.

The LCC tables provide a simple way for energy managers to decide whether financing or waiting for appropriations is the best business decision, in light of their own experience and judgment concerning their prospects for obtaining appropriations.

## More Good News—Study Indicates Equipment Prices the Same for Super ESPC Projects as for Appropriations-Funded Energy Projects

ORNL's study also includes a rigorous analysis of equipment pricing, based on data for about \$13 million worth of energy conservation

measures (chiller replacements, lighting retrofits, and variable-frequency drives) from Super ESPC projects and about the same size sample from one agency's appropriations-funded projects. The results of this analysis indicate that contractors' pricing of equipment is essentially the same in Super ESPCs as in appropriations-funded, bid-to-spec energy projects. The Super ESPC prices comprised the entire delivery order award price, including mark-up, but not including interest paid during the term of the contract.

The authors of the report are preparing to broaden the scope of the equipment pricing study by applying the price analysis methods to more energy project data that is being provided by several additional agencies.

Agency staff who are interested in learning more or would like to apply the study's methods to their own energy projects can refer to the technical report, which details the methodology used to analyze and compare prices.

## ORNL Report Available Online

Details of the study's methods and results are documented in the report ORNL/TM-2002/150, *Evaluation of federal Energy Savings Performance Contracting—Methodology for Comparing Processes and Costs of ESPC and Appropriations-Funded Energy Projects*, which is available at [www.ornl.gov/femp/index.html](http://www.ornl.gov/femp/index.html), under the “Project Financing” heading.

*For more information, please contact Tatiana Strajnic, FEMP's Super ESPC Program, at 202-586-9230, or [tatiana.strajnic@ee.doe.gov](mailto:tatiana.strajnic@ee.doe.gov).*

*Send any specific comments and suggestions about this study to Keith Kline of ORNL, [KlineKl@ornl.gov](mailto:KlineKl@ornl.gov), or 865-574-4230.*

## Take the First Step with SAVEnergy

As the saying goes, the first step is always the hardest. FEMP's SAVEnergy Program can make the first step in identifying cost-effective energy and water efficiency projects easier for federal energy managers. Since 1999, a blanket purchase agreement has been in place with nine small business firms to assist federal agencies in identifying projects for implementation and meeting the requirement to audit 10 percent of their facilities annually.

When the current agreement expires next spring, energy managers will still be able to count on SAVEnergy as one resource to address their audit needs. FEMP is working to make the process of acquiring audits even simpler. While FEMP will continue to provide funding for the audit (cost-sharing is always welcome!), energy managers will be able to select an audit firm directly from the General Services Administration's (GSA's) Energy Management Services Schedule (see related article page 21). FEMP's SAVEnergy Team will assist in arranging a comprehensive energy and water survey, and even identify advanced technologies for consideration.

In the meantime, we encourage federal energy managers to keep the requests coming. Please submit your requests early and continue working toward your energy and water efficiency goals.

*If you are interested in getting your agency involved in this energy- and cost-saving program, see the SAVEnergy Program's web site at [www.eere.energy.gov/femp/techassist/savenergyprog.html](http://www.eere.energy.gov/femp/techassist/savenergyprog.html) or please contact Will Prue, FEMP, at (202) 586-4537 or Karen Thomas, NREL FEMP, at (202) 646-5223. SAVEnergy request forms, which include DOE Regional Office program contacts, can be obtained at [www.eere.energy.gov/femp/techassist/audit.html](http://www.eere.energy.gov/femp/techassist/audit.html).*

## Your Alternative Financing Questions Answered

**There are 96 energy service companies (ESCOs) listed on DOE's *Qualified List of Energy Service Companies*. Did DOE sign umbrella contracts with all of them? What is the difference between "qualified ESCOs" and ESCOs that are allowed to propose Super Energy Savings Performance Contract (ESPC) request for proposals?**

Not all the ESCOs on the DOE qualified list were awarded contracts with DOE. Solicitations were issued for the various umbrella contracts (known as indefinite-delivery, indefinite-quantity – IDIQ contracts). Companies interested in responding to the solicitation were required to be on the DOE prequalified list.

In response to the solicitations, DOE received a large number of proposals. The number varied depending on the region or technology the solicitation addressed. Contracts were awarded to the best qualified of those contractors.

More about Super ESPCs and the qualified list of ESCOs is available at the FEMP Super ESPC web site at [www.eere.energy.gov/femp/financing/espc/esco.html](http://www.eere.energy.gov/femp/financing/espc/esco.html).

*FEMP Focus* featured an article about DOE's *Qualified List of Energy Service Companies* and what it means to be an ESCO in the August 2002 Issue. The article is available at: [www.eere.energy.gov/femp/newsevents/cfm/fempfocusarticle.cfm?newsID=116](http://www.eere.energy.gov/femp/newsevents/cfm/fempfocusarticle.cfm?newsID=116).

**Who is responsible for providing an ESPC project's financing insurance, and how is the amount of insurance coverage determined?**

The contractor (ESCO) is responsible for submitting proof of insurance within 15 days after the delivery order award or acceptance of the design and construction package, after which the agency contracting officer issues a notice to proceed with design, and the ESCO begins the work specified in the delivery order.

The amount of the insurance coverage and the terms would be dictated by the requirement of the financing party, the contracting officer, and ultimately the ESCO. As suggested in Request for Proposal (RFP) H.16, the required coverage may vary from project to project.

*What questions do you need answered? FEMP wants to provide the most useful information possible, but we need your help to achieve this! Please submit your questions via e-mail to Tatiana Strajnic of FEMP at [tatiana.strajnic@ee.doe.gov](mailto:tatiana.strajnic@ee.doe.gov).*

## ENERGY STAR® Designates High-Efficiency Buildings

In a flurry of recent activity, several federal facilities have been designated as ENERGY STAR® buildings. ENERGY STAR®, a joint DOE and Environmental Protection Agency (EPA) voluntary labeling program, promotes energy-efficient choices. For buildings, energy consumption is benchmarked on a 0 to 100 scale. Buildings earning a score of 75 or greater while maintaining an acceptable indoor environment qualify for the award.

### Department of Veterans Affairs

In May, a ceremony was held at Department of Veterans Affairs (VA) Headquarters, Washington, DC, to celebrate the award of ENERGY STAR® building rating to 18 VA medical centers. Presenting the awards were David Garman, Assistant Secretary for Energy Efficiency and Renewable Energy, Department of Energy (DOE); Christie Whitman, Administrator, Environmental Protection Agency (EPA); and Anthony Principi, Secretary of Veterans Affairs.

The medical centers recognized are in the top 25 percent in energy performance among all hospitals in the United States. The VA medical centers were identified and qualified for the award through a joint effort by the VA, FEMP, the EPA, and DOE's Oak Ridge National Laboratory. An interagency team comprised of Beverly Dyer, FEMP; Terry Sharp, ORNL; Raj Garg, VA; and Clark Reed, EPA, benchmarked every VA hospital in the United States. The ENERGY STAR® evaluation involved more than 150 VA medical centers with approximately 150 million square feet of hospital space.

Medical facilities are one of the most energy intensive building types, using energy at twice the rate of office space and three times the rate of schools. In the federal sector, there are more than 200 hospitals in the United States, which represent approximately 13 percent of the energy used in all federal buildings.

"Now more than ever before, it is critical that we provide federal leadership to save money through smart energy practices in our nation's hospitals. These scarce resources can be better applied to serving the medical needs of our veterans and all Americans," said Assistant Secretary Garman.

VA hospitals comprise 70 percent of the medical facilities that have received the ENERGY STAR® label. In terms of real energy and financial benefits, the 18 VA hospitals that achieved the rating are saving more than 1 trillion Btu of energy annually—equivalent to more than \$100 million in cost savings in the next 10 years compared to the average hospital.

The award-winning hospitals are Hunter Holmes McGuire VAMC, Richmond, VA; VA Puget Sound Healthcare-Seattle, WA; Boise VAMC, ID; Central Arkansas Veterans Health Care System-Little Rock; Louis A. Johnson VAMC, Clarksburg, WV; North Arizona VAMC-Prescott; Philadelphia VAMC, PA; VA Pittsburgh Healthcare System-University Drive, PA; Wilmington VAMC, DE; Portland VAMC, OR; South Arizona VAMC-Tucson; Connecticut VAMC, Westhaven; VA Palo Alto Health Care System, CA; New Mexico VA Healthcare System-Albuquerque; VA Boston Healthcare System-Jamaica Plain Campus, MA; VA Northern Indiana Health Care System-Fort Wayne Campus; Fargo VAMC, ND; and Fort Harrison VAMC, MT.

### DOE Germantown Headquarters Building

Receiving a score of 83, DOE's Germantown building became the fifth DOE facility to achieve this recognition. "Achieving the ENERGY STAR® label for the Department of Energy's headquarters building in Germantown, Maryland, demonstrates that the Energy Department is 'walking the walk' and leading by example in energy efficiency," David Garman, DOE Assistant Secretary, Energy Efficiency and Renewable Energy, said at a ceremony held in April. "There is no better place to start than in our own back yard."

In FY 2002, the Germantown facility achieved a 41 percent reduction in energy consumption, as compared to a FY 1985 baseline. For 8 years, the facility has exceeded the goals set forth in Executive Order 13123. The overall savings associated with these efforts is more than \$2.5 million. Contributing to the reduction in energy consumption are the following energy-efficient projects:

- Installation of new roofs with high insulative properties on all buildings.
- Installation of a building-wide energy management control system.
- Energy-efficient lighting fixture retrofits.
- Replacement of all existing windows with low emissivity, argon gas-filled, double-paned, evergreen-tinted windows with thermal-break frames.
- A new energy-efficient CFC free refrigeration plant.
- Replacement of motors on the main air handling units with energy-efficient motors.

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## ENERGY STAR® DESIGNATES HIGH-EFFICIENCY BUILDINGS

(continued from page 29)

### Pacific Northwest National Laboratory

In 2003, after some hard work by the staff, DOE's Pacific Northwest National Laboratory (PNNL) received word that two of its office buildings had achieved ENERGY STAR® status. These are two of fifteen buildings in the state of Washington, and the only buildings in eastern Washington, to be recognized.

The two buildings—Sigma II and V—comprise 20,100 square feet and 47,900 square feet (a two-story building), respectively. While Sigma II is exclusively office space, Sigma V is approximately 90 percent office space and 10 percent laboratory space.

PNNL achieved the ENERGY STAR® ratings through a variety of measures. A program to increase energy awareness was implemented and staff were educated about the need to turn off lights and equipment in unoccupied rooms and to turn off their computers when not in use. Over time, fewer lights and equipment were left on. Computer monitors were also set by the internal PNNL network to go into hibernation after 20 minutes of non-use. In both buildings, occupancy sensors were installed in common areas (conference, lunch, rest, storage, and copy rooms). Also, Watt Stoppers® motion-controlled power strips were distributed to staff to reduce standby power/plug load requirements in offices.

In the Sigma V building, a lighting retrofit from T12 type lighting to more energy efficient T8 lights was implemented, resulting in a savings of 154,163 kilowatt-hours per year of electricity and \$6,167 per year (at \$0.04 per kilowatt hour). Sigma V achieved an ENERGY STAR® rating of 75, and the energy-efficient measures taken have a payback of 8 years. Energy use has been reduced by 14 percent.

The Sigma II building was 24 years old when two new HVAC systems were installed. Jeff McCullough assumed the role of energy champion for the building to identify and implement no- or low-cost energy saving changes. Office light fixtures were reduced from 4-lamp fixtures to 2-lamp fixtures. Thermostats were checked regularly and adjusted when necessary. Soffit lights were changed to energy-efficient lighting, and water heaters were lowered to 110° F for tanks serving restrooms and 120° F for tanks serving both restrooms and kitchens. These efforts helped staff to become more aware of, and personally engaged in, saving energy. The continued savings in energy use means that staff behavior has been sustained over time. The energy use in Sigma II has decreased by approximately 20 percent when compared to previous years. The building achieved a rating of 79 by ENERGY STAR®.

Mike Moran, the PNNL Facility Energy Program Manager, says "PNNL has demonstrated that hardware upgrades and human leadership are both effective ways to save energy; however, the synergy created by combining both strategies has had the greatest impact on the bottom line."

The ENERGY STAR® award supports President Bush's National Energy Policy, which calls for America to increase conservation efforts, accelerate the protection and improvement of the environment, and enhance our nation's energy security. For more information on ENERGY STAR® visit the program's web site at [www.energystar.gov](http://www.energystar.gov).

*For more information on the Germantown office building, please contact Will Prue at 202-586-4537 or [wilfred.prue@ee.doe.gov](mailto:wilfred.prue@ee.doe.gov). For information on the PNNL buildings, contact Mike Moran at 509-372-2680 or [mike.j.moran.jr@pnl.gov](mailto:mike.j.moran.jr@pnl.gov). For more information on the VA medical centers, contact Beverly Dyer at 202-586-7241 or [beverly.dyer@ee.doe.gov](mailto:beverly.dyer@ee.doe.gov).*

CHANGE FOR THE  
BETTER WITH  
ENERGY STAR

# FEMP Awards 2003 Federal Energy Saver Showcase Facilities

**T**wenty outstanding federal facilities were recently awarded federal Energy Saver Showcase designation. Each facility receives a plaque notifying visitors they are entering a government building that uses energy and water wisely and saves taxpayer dollars.

Since 1995, FEMP has recognized more than 100 facilities across the country and the globe as federal Energy Saver Showcases. This year's showcase facilities utilize technologies and strategies that range from low-energy building design and construction to solar photovoltaics (PV) and green power purchases. Each facility nominated by their respective agencies features energy efficiency, renewable energy, or water conserving technologies designed to save natural resources and reduce operating costs, as well as provide secure and reliable energy.

The Department of Defense is making great strides in implementing renewables in their facilities, with 12 of the 20 facilities represented by the Navy, Army, Air Force, and Marines. Other agencies receiving awards include the Department of Health and Human Services, the Department of Agriculture, the Department of the Interior, the Department of Commerce, and the General Services Administration. FEMP commends all the individuals and agencies who have contributed to the successful implementation of these projects. The following are brief descriptions of each 2003 showcase facility.

## **U.S. Department of Agriculture**

### **U.S. Arid Land Agricultural Research Station Maricopa, Arizona**

This newly-constructed research facility was designed with energy conservation in mind. It incorporates daylighting, low-e glazing and thermal break frames, occupancy sensors, and automatic daylight controls as well as utilizing direct digital controls (DDC), variable frequency drives, and water-efficient plumbing fixtures. Rainwater collection and a wetland sewage treatment system complete the outside of this energy-efficient building.

## **U.S. Department of Commerce**

### **National Oceanic and Atmospheric Administration Atlantic Oceanographic and Meteorological Laboratory Miami, Florida**

This project, funded through a utility energy service contract, upgraded the building lighting system, replaced HVAC controls, and installed a thermal energy storage system to shift some of the HVAC load to off-peak hours. These improvements reduce

demand by almost 40 percent while making needed improvements in the building's energy infrastructure and saving the government almost \$46,000 per year.

## **U.S. Department of Commerce**

### **National Oceanic and Atmospheric Administration Caribou Weather Forecast Office (WFO) Caribou, Maine**

A prototype for future WFOs with a potential Silver rating under the Leadership in Energy and Environmental Design (LEED™) program, this building incorporates recycled building materials, and diverted 75 percent of the total project waste from landfills. The building also uses daylighting and a geothermal heating and cooling system.

## **U.S. Department of Defense**

### **Air Force – Dyess Air Force Base Dyess, Texas**

This ESPC project diverted effluent water on the Base for irrigation, saving more than 160 million gallons of potable water per year. The facility also committed to a purchase of 100 percent renewable energy (from wind energy sources), the equivalent of 78 gigawatt-hours of energy and the largest single purchase of renewable power ever made in the United States.

## **U.S. Department of Defense**

### **Air Force – Fairchild Air Force Base Fairchild, Washington**

Utility energy service contract projects on this Base included the installation of light pipe technology, infrared radiant heat in hangars, and energy efficient lighting. A central steam plant was replaced with separate boilers in 78 buildings through an ESPC, which reduced energy from 16 to 33 percent. Also notable is the Base's purchase of 7,800 megawatts of electricity from wind and 3,500 megawatts from other sources of green power, with a goal of 100 percent of electricity from wind or green power by FY 2004.

## **U.S. Department of Defense**

### **Air Force – Grand Forks Air Force Base Grand Forks, North Dakota**

This ESPC project included the installation of distributed high-efficiency boilers, high-efficiency lighting, infrared radiant heaters, and hot water heaters. It also included the construction of a synthetic natural gas (SNG) plant, which provides replacement gas to the system during periods of high demand on the local commercial natural gas system. The SNG plant reduced natural gas usage by 29 percent from the previous year.

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### FEMP AWARDS 2003 FEDERAL ENERGY SAVER SHOWCASE FACILITIES

(continued from page 31)

#### U.S. Department of Defense

**Air Force – Laughlin Air Force Base – Buildings 241, 244, 246, 253, 255, and 256**

**Laughlin, Texas**

The central hot/chilled water plant on this Base received numerous modifications including the installation of a direct digital facility automation system and a thermal storage system. These projects, completed through an ESPC, also included lighting retrofits in three of the buildings, with more planned for the future. The savings from all the retrofits and modifications are projected to be more than \$1.9 million over the 20-year life of the contract, with many more energy-saving improvements already in the planning stages.

#### U.S. Department of Defense - Air Force

**McConnell Air Force Base**

**McConnell, Kansas**

Efficient gas-fired pulse combustion boilers replaced two high-pressure natural gas-fired steam boilers in this project that eliminated the need for a \$290,000-per-year service contract. The project also replaced existing conventional air conditioning chillers with a rotary chiller unit as well as replaced short-life inefficient boilers with an efficient, long-life expectancy domestic hot water boiler and a scotch marine boiler. These measures, combined with other projects that were implemented, will save an estimated \$65,000 annually.

#### Department of Defense

**Air Force – Travis Air Force Base**

**Travis, California**

The Base replaced three steam boilers with six compact pulse hydronic boilers and completed a lighting retrofit of 51 buildings throughout the facility. The lighting project is projected to save 53 percent of previous energy use, while the boiler replacement will save 72 percent.

#### U.S. Department of Defense

**Army – Coleman Barracks - Building #57**

**Mannheim, Germany**

This project capitalized on the need to repair a damaged roof by simultaneously installing photovoltaic panels and conducting roof repairs, thus saving manpower and money, and ultimately saving energy and reducing emissions.

#### U.S. Department of Defense

**Army – Fort Carson Green Training Building**

**Fort Carson, Colorado**

This 2,800-square-foot sustainable training facility incorporated natural daylighting and high-efficiency windows to reduce energy use for heating and cooling and a natural cooling cupola that eliminates the need for air conditioning. The building also utilized recycled content construction materials, an exterior PV security light and PV walkway lights, low-flow and metered faucets, and xeriscaping for a total estimated savings of 9,000 kilowatt-hours per year. This building design will be used in future facilities.

#### U.S. Department of Defense

**Army – Watervliet Arsenal – Buildings 19, 110, and 115**

**Watervliet Arsenal, New York**

This project involved the implementation of an emerging technology, proton exchange membrane (PEM) fuel cells. Ten PEM fuel cells have been installed at three separate sites within the arsenal. This cutting-edge technology is expected to save the site 37.5 megawatt-hours per year.

#### U.S. Department of Defense

**Marine Corps – Marine Corps Air Station Beaufort**

**Beaufort, South Carolina**

The installation at this facility of an energy management and control system is saving more than 34 billion Btu, or 10 gigawatt-hours, annually. The system controls heating, cooling, and lighting as well as managing peak loads. This project set a precedent, with Air Force and Naval bases now working to implement the same type of systems.

#### U.S. Department of Defense

**Marine Corps – Twentynine Palms Marine Corps Base – Building 1579**

**Twentynine Palms, California**

In an effort to address the California energy crisis, this Base installed the largest cogeneration plant in the United States. The 7 megawatt combined heat and power plant can provide an uninterrupted power supply for critical Base loads in the event of any utility interruption and the ability to isolate critical loads even when power from the utility is available. The project was financed through an ESPC and will reduce electricity purchases by nearly two-thirds, saving \$5.8 million in annual energy costs.

#### U.S. Department of Defense

**Navy – Naval Surface Warfare Center – Dahlgren Division**

**Dahlgren, Virginia**

A single direct digital control (DDC) system was installed at this site and now controls 80 percent of the square footage of the facility. This system is capable of shutting down Base-wide HVAC systems in seconds, which is necessary for homeland security functions. The DDC system has saved nearly \$7 million since its inception in FY 1991.

#### U.S. Department of Health and Human Services

**Food and Drug Administration – Jefferson Laboratories**

**Washington, DC**

Variable frequency drive and pumping controllers, as well as variable air volume fume hoods, daylighting, and low flow plumbing fixtures were installed in this laboratory building through a utility energy service contract. The building now boasts a 39 percent reduction in energy consumption. The success of this UESC has been and will continue to be promoted throughout the Department.

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## DOE Prominent in “Closing the Circle” Awards

On June 10, 2003, DOE and other federal agencies received White House “Closing the Circle” awards for their outstanding environmental stewardship. Twenty-six teams were honored for outstanding military and civilian facility efforts in such categories as environmental management systems, education and outreach, purchase of environmentally preferable and bio-based products, sustainable design for buildings, waste and pollution prevention, and recycling. This ninth annual White House ceremony was held in the Eisenhower Executive Office Building in Washington, DC.

John L. Howard, Jr., the Federal Environmental Executive, noted: “The Closing the Circle award winners have demonstrated that the Federal government can lead by example. We’re proud of all that they’re doing to improve the quality of life in each of their communities.”

In the category of Education and Outreach, the federal Network for Sustainability

(FNS) was recognized for working to promote environmental stewardship in the federal government. The four agencies accepting the award for the FNS were the Department of Energy, Navy, Environmental Protection Agency, and the National Park Service. The FNS is an alliance of 13 West Coast federal agencies who share staff, authorities, and experience to collectively reduce waste, pollution, and energy consumption. The principal goal of the Network is to use the consumer power of the federal government to promote sustainable practices. In 2002, they focused their efforts on promoting use of 100 percent recycled content copier paper, Environmental Management Systems, electronics equipment disposal, and green power purchases.

DOE’s Sandia National Laboratories also was honored at the ceremony. The Model Validation and Systems Certification Project represented the Lab’s first attempt to incorporate sustainability into a local

major construction project, and received an award for Sustainable Design/Green Buildings. The project requirements and the design and construction processes included sustainable design features based on the U.S. Green Building Council’s Leadership in Energy and Environmental Design™ rating system. The model validation project was constructed by renovating an existing facility at the lab. In particular, the sustainable design specifications addressed site considerations, the building envelope, energy efficiency, indoor air quality, safeguarding water, procurement of recycled content items, and recycling of construction material. The process developed during the model validation has become a standard for other Sandia projects, with eight more buildings at Sandia now being evaluated using the same process.

For more information on the “Closing the Circle” awards, visit: [www.ofee.gov/whats/ctcspr03.htm](http://www.ofee.gov/whats/ctcspr03.htm).

### FEMP AWARDS 2003 FEDERAL ENERGY SAVER SHOWCASE FACILITIES

(continued from page 32)

#### U.S. Department of the Interior Fish and Wildlife Service – Herbert H. Bateman Educational and Administrative Center Arlington, Virginia

The construction of the Center will eliminate nearly \$800,000 in backlog maintenance needs by replacing five inadequate buildings with the new facility. Much of the currently occupied land will revert to wildlife uses, and xeriscaping and onsite wastewater recycling will lead to reduced site disturbance. The project utilized daylighting and energy efficient lighting as well as geothermal heat pumps and rapidly renewable building materials.

#### U.S. Department of the Interior National Park Service –

#### White River Facility Operations Center White River, Washington

Capitalizing on the need to replace an old garage structure, this building was designed to optimize solar potential for a PV array in the rainy Pacific Northwest. But this system is highly effective, eliminating noise and pollution previously emitted by generators, as well as providing a 95 percent energy savings over the previous generation system.

#### General Services Administration and Social Security Administration Annex Building at SSA Main Complex Baltimore, Maryland

A complete renovation of this building avoided \$25 million in new construction costs, while the recycling and salvaging of materials from the original interior led to 76 percent of the original building’s interior materials being reused. Daylighting and updated lighting led to a 32 percent reduction in lighting energy use. Thermal

ice storage, auto shut-off and low-flow bathroom fixtures were installed inside, and indigenous shrubs and trees were added to reduce water consumption outside.

#### General Services Administration Oroville-Osoyoos Border Crossing Oroville, Washington

This building, which was a joint collaboration between the United States and Canadian governments, uses a ground-source heat pump (GSHP) for the production of high efficiency heating and cooling. The GSHP saves 4.9 gigawatt-hours of electricity per year. The building also incorporated recycled steel and studs, low VOC paint (little or no volatile organic compounds), fly ash concrete, automated irrigation, and a low maintenance native landscape.

For more information, please contact Trina Masepohl of NREL FEMP at 303-384-7518 or [trina\\_masepohl@nrel.gov](mailto:trina_masepohl@nrel.gov).



### CHP AND PV INCREASE POWER RELIABILITY AT TWENTYNINE PALMS MAGTFTC

(continued from page 1)

With more than 10,000 military personnel and family members housed at Twentynine Palms, where summer temperatures can reach higher than 120 degrees, a reliable power supply is a necessity, as is cooling indoor environments. The new CHP unit provides a reliable, efficient, secure energy source at a low cost to support the Base's missions.

The CHP system will reduce the Base's need to purchase electricity from the local utility by almost two-thirds, resulting in an annual cost savings of approximately \$5.8 million. The savings represent the net effect of reduced electricity purchases, increased natural gas purchases, and maintenance, operation, repair, and replacement costs for the cogeneration system. And in the event of a power outage, the CHP system will provide reliable power to four critical load circuits on the Base using natural gas (or diesel in the event of gas interruption).

The project was accomplished under an energy savings performance contract (ESPC) administered by the U.S. Army Corps of Engineers and the Naval Facilities Engineering Service Center. ESPCs allow federal agencies to fund improvements from guaranteed energy savings and energy-related operational savings. The contract was awarded September 2001, construction began May 2002, and the project was completed in the spring of 2003.

The total cost of the CHP system was \$16.2 million and included the construction of a new 7,200 square-foot turbine hall, the 3-mile high-pressure gas line, and all connections to the electrical substation feeding the critical base loads. After generating electricity, the natural-gas-driven hot turbine exhaust is captured in a heat-recovery generator to supply the Base's high-temperature hot water system and to power a 200-ton absorption chiller for turbine inlet air cooling and turbine hall space conditioning. The turbine will provide approximately 30 to 35 million Btu per hour of high-temperature hot water through the heat-recovery

hot-water generator. During summer operations the high-temperature hot water produced will power three new absorption chillers, one in each new chiller plant (approximately 1,650 tons of cooling). The system has dual-fuel capability to enable the base to make a seamless switch between gas and diesel if there is an interruption in the natural gas fuel supply.

The project also involves installing new fiber-optic communication cabling to connect the cogeneration plant with monitoring and control equipment at the electricity substation serving the Base. When complete, the overall system efficiency is expected to be 75 percent, 2.5 times greater than the average efficiency of the U.S. electric grid.

The collaboration of many parties contributed to the project's success. The USMC-MAGTFTC, the U.S. Naval Facilities Engineering Service Center, and the energy service company, Johnson Controls, Inc., were primary partners. FEMP took an early interest in the Twentynine Palms project as a showcase for CHP in federal facilities. FEMP helped identify funding for initial design work and provided technical guidance. Southern California Gas completed a preliminary design and feasibility study, funded by DOE's Office of Distributed Energy Resources. Johnson Controls completed final designs, implemented, and financed the project under the Army Huntsville ESPC.

This CHP project is a resounding technical and financial success. It demonstrates the ability of CHP projects to have a broad impact by not only paying for itself, but also by financing renewable energy projects that further reduce peak loads. It also shows how a base-loaded CHP system can be a very cost-effective approach for addressing energy security objectives at federal sites.

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## Conferences

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